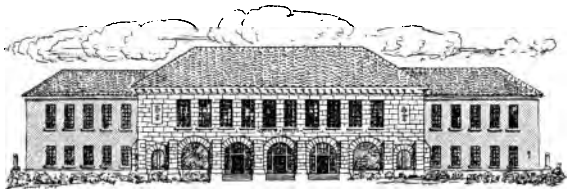
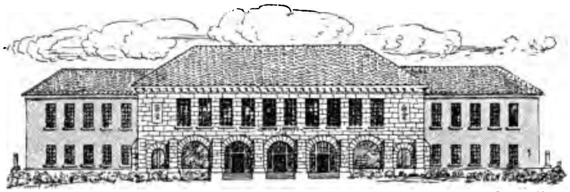
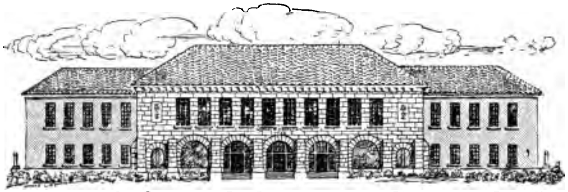
TY ARITHMETIC

BRENELLE HUNT

AMERICAN BOOK COMPANY







A COMMUNITY ARITHMETIC

BY

BRENELLE HUNT

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COMMUNITY ARITHMETIC
E. P. 4

PREFACE

Most modern textbooks in arithmetic contain a logical development of processes as well as excellent drills. The author's long experience, however, has impressed on him the fact that the greatest difficulty encountered by teachers consists in providing suitable *applications* for the processes taught — applications which give the pupils a clear understanding of industrial and business activities that have an arithmetical basis.

This is a book of *applications* to be placed in the hands of pupils in the upper grades of the Elementary School or in the Junior High School. Neither teachers nor pupils require a first-hand knowledge of the lines of business or industry studied, as the lessons furnish the necessary information and explain how the processes apply. The lessons show the community *needs* and develop the *processes* as the needs arise.

Many lines of work common to the average large town and based on arithmetical processes are represented in these lessons. Enough pages have been devoted to each subject to secure an intelligent understanding of the business or industry as well as to show how the processes apply.

The lessons in the first part of the book require a knowledge of fundamental operations only. Later lessons involve common and decimal fractions, the most commonly used facts of the denominate number tables, and percentage and interest.

The author has constantly kept in mind the facts that most pupils are to become wage earners, that all should become producers, that industry is founded on economy of material, and that the success of the individual depends largely on economy in his expenditures and wise investment of his savings.

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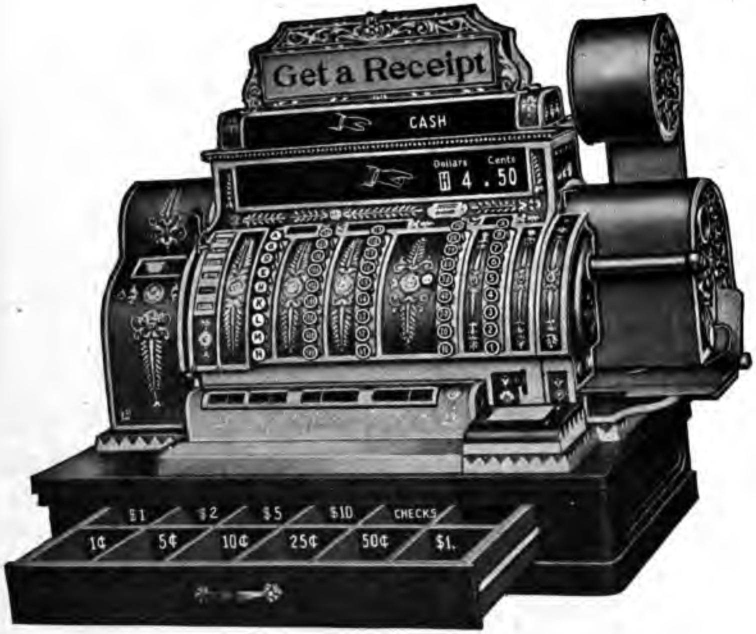
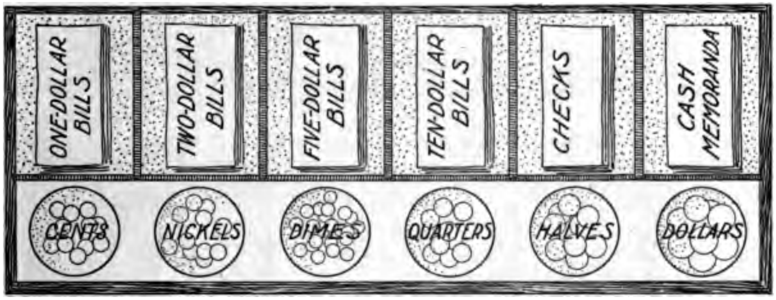

Get a Receipt
CASH
Dollars
Cents
4 . 50
$1
$2
$5
$10
CHECKS
1¢
5¢
10¢
25¢
50¢
$1.

MAKING CHANGE

GENERAL METHOD



Buying and *selling* constitute an important part of business. As such transactions often necessitate the making of change, boys and girls should learn to *make change* quickly as well as accurately.

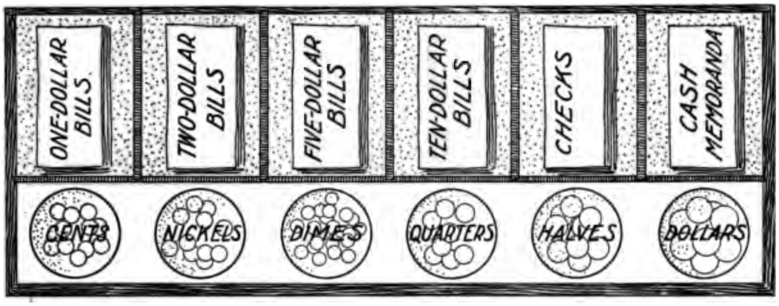
The above diagram shows a common arrangement of a cash drawer, with coins in the front row and bills in the back.

If you purchase something worth 38 cents and present a $2.00 bill, the clerk will probably count out the change as follows: He will name the cost "38 cents" and, handing you 2 cents, will say "40"; then handing you a dime, he will say "50"; then handing you two quarters, he will say "$1.00"; and finally, handing you $1.00, he will say "$2.00", thus naming the amount of the bill presented.

In making change, always add to the price of the purchase, beginning with the smallest coin.


PURE QUAKER OATS
25
PURE QUAKER OATS
10
Kellogg's TOASTED CORN FLAKES
12
MALT BREAKFAST FOOD
15
GRAPE NUTS A Food
13
GRAPE NUTS A Food
13
POSTUM CEREAL
15
CHASE & SANBORN'S GROUND COFFEE
45
Seeded RAISINS
8
CURRANTS
10
SALADA
SALADA
SALADA
60
COCOA
38
OLIVE OIL
OLIVE OIL
35
OLIVES
OLIVES
25
SUGAR CORN
15
BEANS
18
TOMATOES
15
SALMON
SALMON
25
SARDINES
SARDINES
SARDINES
SARDINES
SARDINES
15
PURE LEAF LARD
13
PRINT BUTTER
PRINT BUTTER
40
38
BUTTER
32
CHEESE
15
PRUNES
30
EGGS
$6.70
FLOUR
5¢ Lb
$15.00
SUGAR
4¢ Lb
CORN MEAL
15
KEROSENE

SELLING GROCERIES



What coins should be taken from the cash drawer, and in what order, if $1.00 is paid for each of the following?

1. 1 Large Package Quaker Oats.
2. 2 Small Packages Quaker Oats.
3. 1 Package Corn Flakes.
4. 1 Package Malt Breakfast Food.
5. 2 Packages Postum.
6. 1 Package C. & S. Coffee.
7. 3 Packages Raisins.
8. 1 Package Salada Tea.
9. 1 Package Currants.
10. 1 Can of Cocoa.

Specify the coins selected, and the order, if $.50 was paid for each article as follows:

11. 1 Bottle of Olive Oil.
12. 1 Bottle of Olives.
13. 1 Can of Corn.
14. 1 Can of Beans.
15. 1 Can of Tomatoes.
16. 1 Can of Salmon.
17. 1 Can of Sardines.
18. 1 lb. of 38¢ Butter.
19. $\frac{3}{4}$ lb. of 40¢ Butter.
20. $\frac{1}{2}$ lb. of 32¢ Cheese.

Select the proper coins for change in the following:

21. 1 Large Bottle of Olives. Customer gives $2.00.
22. 1 lb. of Prunes. Customer gives $1.00.
23. $1\frac{1}{2}$ lb. of 40-cent Butter. Customer gives $2.00.


PURE QUAKER OATS
25
PURE QUAKER OATS
10
Kellogg's TOASTED CORN FLAKES
12
MALT BREAKFAST FOOD
15
GRAPE NUTS A Food
13
GRAPE NUTS A Food
13
POSTUM CEREAL
15
CHASE SANBORN GROUND COFFEE
45
Seeded RAISINS
8
CURRANTS
10
SALADA SALADA SALADA
60
COCOA
38
OLIVE OIL
OLIVE OIL
35
OLIVES
OLIVES
25
SUGAR CORN
15
BEANS
18
TOMATOES
15
SALMON SALMON
25
SARDINES SARDINES SARDINES SARDINES SARDINES
15
PURE LEAF LARD
13
PRINT BUTTER
PRINT BUTTER
40
38
BUTTER
32
CHEESE
15
PRUNES
30
EGGS
$6.70
FLOUR
5¢ Lb
$15.00
SUGAR
4¢ Lb
CORN MEAL
15
KEROSENE

SELLING GROCERIES—TWO PURCHASES

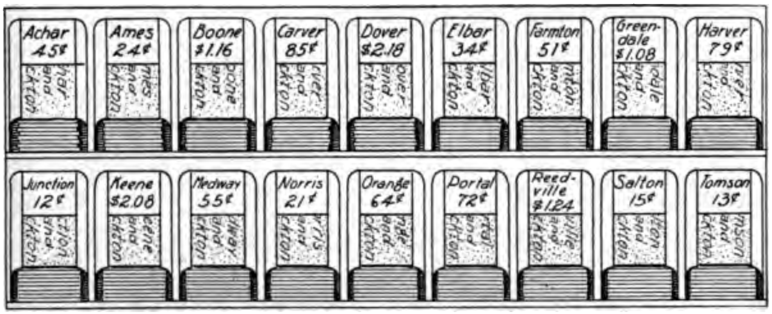
Rule a sheet of paper as follows and write in the second column the cost of each purchase described in the first column. Also write in the **change columns** the number of coins of each value which you would select in making change.

Do all this mentally.

Fill in each line in the same manner as the first line.

Purchase	Cost	Money Presented by Customer	Coins and Bills Given in Change							
			1¢	5¢	10¢	25¢	50¢	$1.00	$2.00	$5.00
1 Small Q. Oats and 1 Corn Flakes	$.10 .12 $.22	$1.00	3			1	1			
1 Postum and 1 C. & S. Coffee	?	$2.00								
1 Malt B. Food and 1 Grape Nuts	?	$1.00								
Raisins and Currants	?	$ .50								
1 Olive Oil and 1 Can Corn	?	$1.00								
1½ lb. of 38¢ Butter	?	$2.00								
2 Cans Sardines and 1 lb. Lard	?	$2.00								
1 lb. Lard and ½ lb. Cheese	?	$ .50								
1 Can Salmon and 1 lb. Lard	?	$1.00								
1 Can Tomatoes and 1 Can Beans	?	$2.00								
1 Can Beans and 1 gal. Kerosene	?	$ .50								
10 lb. Sugar and 3 lb. Corn Meal	?	$2.00								
1 lb. Prunes and ½ doz. Eggs	?	$5.00								

SELLING RAILROAD TICKETS



The above sketch shows part of the rack, or case, in which tickets are kept in the ticket office of a country railroad station. Reading across each row from left to right, we find the tickets arranged alphabetically, to save time in finding them. A little marker shows the price per ticket. The table on page 7 gives the number of tickets called for by different people and the destination of each. It shows also the money given in payment.

Oral and Written Exercise

Select the proper coins for making change and write them out in order on a blank ruled like the one on page 7. (See number 1.)

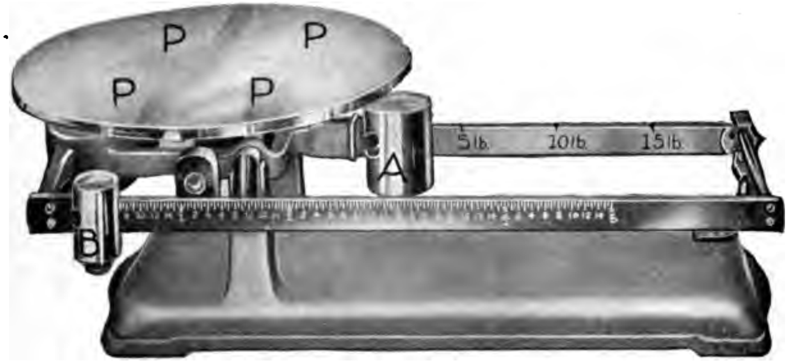
This exercise may be used as written work if the class has not become skilled in making change, or as oral work if the class is proficient.

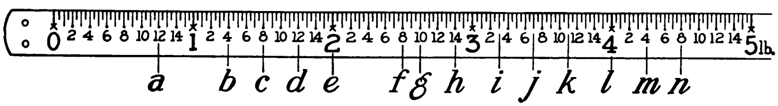
If the exercise is taken as written work at first, it ought later to be used again as a sight drill. As a written exercise, only the change columns need be copied by the pupils.

	Number of Tickets	Destination	Money Presented	Change							
				1¢	5¢	10¢	25¢	50¢	$1.00	$2.00	$5
1.	2	Ames	$5.00	2				1		2	
2.	2	Achar	2.00								
3.	1	Harver	1.00								
4.	3	Junction	1.00								
5.	1	Keene	5.00								
6.	2	Norris	1.00								
7.	2	Reedville	5.00								
8.	2	Salton	.50								
9.	3	Tomson	.50								
10.	1	Greendale	2.00								
11.	2	Carver	2.00								
12.	2	Elbar	2.00								
13.	1	Farmton	.75								
14.	2	Medway	1.50								
15.	1	Orange	.75								
16.	2	Portal	2.00								
17.	3	Ames	1.00								
18.	1	Boone	1.50								
19.	1	Harver	5.00								
20.	1	Medway	.75								
21.	4	Norris	1.00								
22.	2	Dover	10.00								
23.	1	Reedville	1.50								
24.	2	Junction	.50								
25.	2	Keene	5.00								
26.	2	Greendale	2.50								
27.	1	Portal	1.00								
28.	2	Elbar	.75								
29.	5	Salton	2.00								
30.	2	Orange	2.00								
31.	2	Harver	2.00								
32.	4	Junction	1.00								

GROCERY PROBLEMS

USING GROCERS' SCALES





Study carefully these counter scales. The substance to be weighed is placed on the plate *PPPP*, and the sliding weight *A* is moved along the beam until it catches in the notch marked 5 lb. If the scales are evenly balanced, the substance weighs 5 lb.

If the substance does not weigh as much as 5 lb., place the weight *A* at 0 lb. and move the weight *B* along the front beam until the scales are balanced. If it stops at *e*, the substance weighs 2 lb.; at *g*, 2 lb. 10 oz.; at *l*, 4 lb.; at *f*, 2 lb. 8 oz.

Find the weight when:

1. *A* is at 0 lb. and *B* is at *h*.
2. *A* is at 5 lb. and *B* is at *b*.
3. *A* is at 5 lb. and *B* is at *l*.
4. *A* is at 10 lb. and *B* is at *a*.
5. *A* is at 10 lb. and *B* is at *g*.
6. *A* is at 15 lb. and *B* is at *m*.
7. Compute the cost of a piece of 32¢ butter if *A* is at 0 lb. and *B* at *c*; if *A* is at 5 lb. and *B* at *c*.

SELLING BUTTER, CHEESE, EGGS, ETC.

Creamery Price List

Cheeses	Price per Pound	Butter	Price per Pound
Edam	$.95	Best Tub	$.36
Mild Cream	.18	Best Print	.38
Young America	.22	Peanut Butter	.16
Rich Old	.24	Pan-American Coffee	.24
Roquefort	.36	Dried Beans and Peas	Price per Quart
Sage	.24	N.Y. Pea Beans	$.09
Swiss	.32	Yellow Eyes	.12
Compound	.12	Lima	.09
Fat Pork	.16	Cranberry Beans	.14
Lard	.14	Dried Whole Peas	.12
Per 3 lb.	$.40	Split Peas	.10
Per 5 lb.	.65	Canada Peas	.09

Oral Exercise

Find the cost of:

1. $\frac{1}{2}$ lb. Mild cream cheese.
2. $1\frac{1}{2}$ lb. Young America cheese.
3. $\frac{1}{4}$ lb. Sage cheese.
4. $1\frac{1}{4}$ lb. Swiss cheese.
5. $\frac{1}{2}$ lb. Compound.
6. $1\frac{1}{2}$ lb. Compound.
7. $2\frac{1}{2}$ lb. Fat pork.
8. $\frac{1}{2}$ lb. Best tub butter.
9. $1\frac{1}{2}$ lb. Best print butter.
10. $\frac{1}{4}$ lb. Best tub butter.
11. $1\frac{1}{4}$ lb. Best tub butter.
12. $\frac{3}{4}$ lb. Best tub butter.
13. $1\frac{1}{2}$ lb. Peanut butter.
14. $\frac{1}{2}$ lb. P. A. coffee.
15. 8 oz. Young America cheese.
16. 4 oz. Swiss cheese.
17. 8 oz. Mild cream cheese.
18. 8 oz. Roquefort cheese.
19. 4 oz. Rich old cheese.
20. 12 oz. Swiss cheese.
21. 12 oz. Sage cheese.
22. 20 oz. Fat pork.
23. 24 oz. Lard.
24. 12 oz. Best tub butter.
25. 8 oz. Best print butter.
26. 1 lb. 4 oz. Best tub butter.

CLERKS' HELPS

It is practically impossible to cut butter and cheese in *even* pounds. To avoid errors and to save time, a clerk often makes out a table showing the prices of each number of ounces to the nearest cent. The left-hand column in the following card gives a few common prices. The first line shows the charge for each number of ounces at $ .14 a pound. Verify each amount in this line.

CLERKS' TABLE OF PRICES FOR REFERENCE

Price per Pound	Price for Given Number of Ounces													
	1 oz.	2 oz.	3 oz.	4 oz.	5 oz.	6 oz.	7 oz.	8 oz.	9 oz.	10 oz.	11 oz.	12 oz.	13 oz.	14 oz.
$.14	.01	.02	.03	.04	.04*	.05	.06	.07	.08	.09	.10	.11	11	.12
.22														
.26														
.30														
.36														
.38														
.40														

1. Compute the charge for each number of ounces for the 22¢ line. $\frac{1}{16}$ of 22¢ = $\frac{22}{16}$¢ = $1\frac{3}{8}$¢, or 1¢, cost of 1 oz.

All fractions of a cent less than one half cent are not counted.

One half cent and all fractions above that are counted as one cent.

2. Compute the charge for 6 oz. at 26¢ a pound.

$$6 \text{ oz.} = \frac{6}{16}, \text{ or } \frac{3}{8}, \text{ of 16 oz.}; \ \frac{3}{\cancel{8}_{4}} \text{ of } \overset{13}{\cancel{26}}¢ = \frac{39}{4}¢ = 9\tfrac{3}{4}¢, \text{ or } 10¢.$$

3. Compute the other charges for the 26¢ line and the charges on the remaining lines.

* The charges for 4 oz. and 5 oz. are the same, 4¢, as the cost of 4 oz. amounts to $3\frac{1}{2}$¢; and of 5 oz., to $4\frac{3}{8}$¢ (less than $4\frac{1}{2}$¢).

Clerks' Table of Prices

Price per Pound	Price for Given Number of Ounces												
	1 oz.	2 oz.	3 oz.	4 oz.	5 oz.	6 oz.	7 oz.	9 oz.	10 oz.	11 oz.	12 oz.	13 oz.	14 oz.
$.12	.01	.02	.02	.03	.04	.05	.05	.07	.08	.08	.09	.10	.11
.20	.01	.03	.04	.05	.06	.08	.09	.11	.13	.14	.15	.16	.18
.24	.02	.03	.05	.06	.08	.09	.11	.14	.15	.17	.18	.20	.21
.28	.02	.04	.05	.07	.09	.11	.12	.16	.18	.19	.21	.23	.25
.35	.02	.04	.07	.09	.11	.13	.15	.20	.22	.24	.26	.28	.31

Such a table as the above is used only in computing the charge for **ounces**, that is, for fractional parts of a pound. If the purchase weighed 1 lb. 7 oz. @* 20¢, the clerk would look in the above table to find the charge on **7 oz.**, and would add it to the price of 1 pound. (20¢ + 9¢ = 29¢.)

If the purchase weighed 2 lb. 5 oz. @ 24¢, the clerk would look in the table for the charge on **5 oz.** and would add it to the charge for 2 lb., which he could easily compute mentally. (48¢ + 8¢ = 56¢.)

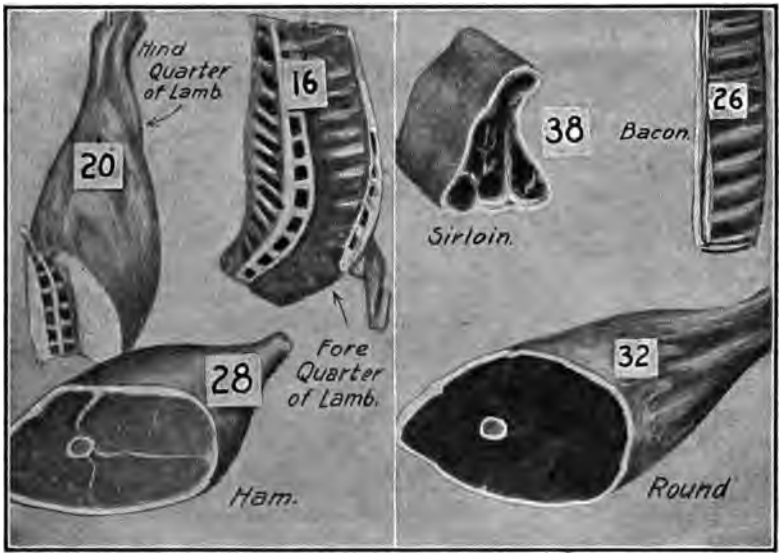
Oral Exercise

Using the above table as directed, compute the charge on each of the following purchases:

1. 1 lb. 3 oz. @ 12¢.
2. 1 lb. 3 oz. @ 20¢.
3. 2 lb. 5 oz. @ 24¢.
4. 1 lb. 7 oz. @ 28¢.
5. 2 lb. 5 oz. @ 35¢.
6. 1 lb. 6 oz. @ 12¢.
7. 2 lb. 7 oz. @ 20¢.
8. 1 lb. 9 oz. @ 24¢.
9. 2 lb. 10 oz. @ 28¢.
10. 2 lb. 11 oz. @ 12¢.
11. 3 lb. 10 oz. @ 20¢.
12. 1 lb. 12 oz. @ 24¢.
13. 1 lb. 13 oz. @ 28¢.
14. 2 lb. 3 oz. @ 35¢.
15. 5 lb. 4 oz. @ 12¢.
16. 1 lb. 13 oz. @ 20¢.

* The sign @ means "at — per pound."

MARKET CLERKS' WORK



Oral Exercise

Find mentally the cost of the following cuts of meat at the prices shown above:

1. Find the cost of 1 lb. 4 oz. of steak @ 40 ¢.

   1 lb. 4 oz. = $1\frac{1}{4}$ lb.; $\frac{1}{4}$ of 40 ¢ = 10 ¢; 40 ¢ + 10 ¢ = 50 ¢.

2. Find the cost of 1 lb. 5 oz. of steak @ 32 ¢.

   Cost of 1 oz. = 2 ¢; of 5 oz. = 10 ¢; 32 ¢ + 10 ¢ = 42 ¢.

3. 4 lb. 8 oz. of 20 ¢ Lamb.
4. 1 lb. 4 oz. of 16 ¢ Lamb.
5. 1 lb. 12 oz. of Ham.
6. 1 lb. 4 oz. of Sirloin Steak.
7. 2 lb. 8 oz. of Sirloin Steak.
8. 1 lb. 1 oz. of Sirloin Steak.
9. 1 lb. 1 oz. of Round Steak.
10. 2 lb. 5 oz. of Round Steak.
11. 1 lb. 7 oz. of Round Steak.
12. 1 lb. 8 oz. of Bacon.
13. 2 lb. 4 oz. of Bacon.
14. 1 lb. 12 oz. of Bacon.

TABLE OF PRICES IN A MARKET

When *computing scales* are not used in weighing meats, it is advisable for a clerk to have a table of prices containing the accurate charge for the different number of ounces as shown on pages 10 and 11.

Using the following table, compute the charge on the purchases indicated below. These purchases are all from the meat chart on the preceding page.

PRICE PER POUND	PRICE FOR GIVEN NUMBER OF OUNCES													
	1 oz.	2 oz.	3 oz.	4 oz.	5 oz.	6 oz.	7 oz.	9 oz.	10 oz.	11 oz.	12 oz.	13 oz.	14 oz.	15 oz.
$.20	.01	.03	.04	.05	.06	.08	.09	.11	.13	.14	.15	.16	.18	.19
.26	.02	.03	.05	.07	.08	.10	.11	.15	.16	.18	.20	.21	.23	.24
.28	.02	.04	.05	.07	.09	.11	.12	.16	.18	.19	.21	.23	.25	.26
.32	.02	.04	.06	.08	.10	.12	.14	.18	.20	.22	.24	.26	.28	.30
.38	.02	.05	.07	.10	.12	.14	.17	.21	.24	.26	.29	.31	.33	.36

Oral Exercise

1. 2 lb. 2 oz. Fore Quarter Lamb.*

2. 4 lb. 3 oz. Hind Quarter Lamb.

3. 1 lb. 1 oz. Bacon.

4. 1 lb. 7 oz. Ham.

5. 2 lb. 3 oz. Ham.

6. 3 lb. 3 oz. Fore Quarter Lamb.

7. 1 lb. 2 oz. Round Steak.

8. 1 lb. 7 oz. Bacon.

9. 6 lb. 6 oz. Hind Quarter Lamb.

10. 1 lb. 3 oz. Sirloin Steak.

11. 1 lb. 1 oz. Round Steak.

12. 3 lb. 12 oz. Fore Quarter Lamb.

13. 1 lb. 13 oz. Bacon.

14. 2 lb. 2 oz. Sirloin.

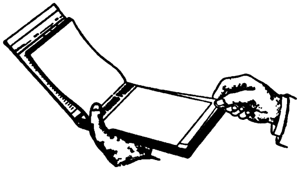
15. 1 lb. 7 oz. Round.

16. 4 lb. 5 oz. Fore Quarter Lamb.

* No table is needed at 16¢.

MAKING OUT SALE SLIPS

During one week Mr. H. H. White made the purchases indicated on the following sale slips. He left the orders on his way to work in the morning, and when the goods were delivered, a sale slip was inclosed, showing the cost of the several items ordered. Examine the items in No. 1 and see if the clerk has made it out correctly. Copy and finish No. 2.



When the clerk wrote out these slips, he also wrote (by means of a sheet of carbon paper) a duplicate of each. The original was kept at the store, while the duplicate was sent with the goods.

A SIMPLE FORM OF SALE SLIP

1. SALE SLIP NO. 1

CURTIS & COOK, GROCERS
BRIDGEWATER, MASS.

MR. H. H. WHITE No. 46 MAIN ST.	DATE, JAN. 10, 1916 CLERK NO. 5		
2 bottles Olives	.25		50
6 lb. Meal	.04		24
½ doz. Eggs	.45		23
10 lb. Sugar	.05		50
		1	47

2. SALE SLIP NO. 2

CURTIS & COOK, GROCERS
BRIDGEWATER, MASS.

MR. H. H. WHITE No. 46 MAIN ST.	DATE, JAN. 11, 1916 CLERK NO. 6		
1 lb. 4 oz.* Lard	.16		—
1 lb. 14 oz. Butter	.40		—
15 oz. Cheese	.32		—
2 pkg. Quaker Oats	.10		—
		—	—

* Fractional parts of a pound appear on most of the following sale slips, as it is impossible to cut meat, butter, etc. in *even* pounds.

Written Exercise

1. Copy Sale Slip No. 3 and complete it.

Rule and make out sale slips for each of the following purchases:

2. Mrs. E. T. Howard ordered by telephone Feb. 3, 1915, 2 cakes of Fairy soap @ \$.05, ½ lb. cheese @ \$.25, 2 lb. best butter @ \$.38, and 2 bottles stuffed olives @ \$.25 each.

3. The following order was put up for John Harwood on Feb. 3: 1 can roast beef @ \$.40, 2 cans wax beans @ \$.10, 2 pkg. Pyle's pearline @ \$.09, 1 pkg. flake tapioca @ \$.08, and a 3-pound pail of lard for \$.40.

SALE SLIP NO. 3

CURTIS & COOK, GROCERS
BRIDGEWATER, MASS.

MR. H. H. WHITE NO. 46 MAIN ST.	DATE, JAN. 13, 1916 CLERK NO. 7		
3 cans Sardines	.15		—
2 cans Peas	.18		—
1 pkg. Grape Nuts			15
1½ doz. Eggs	.45		—
½ lb. Salada Tea	.60		—
		—	—

4. The clerk sent the following to Andrew Dunham on the same date: 2 lb. peanut butter @ \$.15, ½ lb. coffee @ \$.32, 2½ lb. fat pork @ \$.14, and 3 cans grated pineapple @ \$.28 each.

5. Robert White ordered on the same date 1 bag flour @ \$.70, ½ lb. butter @ \$.38, 1 bottle lemon extract @ \$.35, and 2 gal. kerosene @ \$.12.

6. The following articles were put up Jan. 19 for R. S. Smythe of 51 Oak Street: 1 lb. 8 oz. lard @ \$.13, ½ doz. eggs @ \$.62, 2 cans corn @ \$.14, and 2 gal. kerosene @ \$.15.

7. Edward R. Hanscom of 150 Howard Place left an order Jan. 20 which the clerk filled out as follows: 3 cans sardines @ \$.18, 1 bottle olives @ \$.25, 1 can cocoa @ \$.38, 12 oz. cheese @ \$.32, and 1 lb. 4 oz. butter @ \$.38.

Charging Groceries on Sale Slips

It is a common practice in most large towns and cities to order the day's supply of groceries and meat by telephone. The goods, when delivered, are accompanied by a **sale slip** like the following. This may be paid on the arrival of the goods, or at the end of the month, according to the agreement existing between the store and the customer. The slip printed below contains the amount ($5.40) which the customer owes on previous purchases. The amount of the day's purchase ($.67) is added to it, and the total is written in the upper right-hand corner. This avoids the necessity of making a separate weekly or monthly bill.

Mr. EVERETT O. KEITH — Bill to Date, $6.07
Middleboro, Mass. — Date, May 13, 1916

Bought of GARDNER AND COMPANY
Grocers

Salesman No. 3	Owed on former purchases			$5	40
2 lb. P. Sugar	.05		10		
1½ lb. Butter	.38		57		67
				6	07

1. Explain how each of the above amounts was obtained: $.10, $.57, $.67, $6.07.

Make out blank sale slips for Gardner & Company. Fill in each from the following memoranda, dating them for to-day. Prices should be as in the picture on page 2.

2. Mrs. William H. White, who owed $8.64, ordered 1 bbl. of flour, 10 lb. of meal, and 3 doz. eggs. What is her bill to date?

3. Edward R. Haskell, who owed $17.53, ordered by telephone 1 pkg. of corn flakes, 2 pkg. of malt breakfast food, 1 can of Chase & Sanborn coffee, $2\frac{1}{2}$ lb. of 38-cent butter. What is his bill to date?

4. Mrs. Henry Pierce, who owed $13.26, ordered $\frac{1}{2}$ lb. of cheese, 2 lb. of lard, $1\frac{1}{2}$ lb. of 40-cent butter, 2 doz. eggs, and 3 lb. of prunes. What is her bill to date?

5. Charles J. Moore, who owed $1.17, ordered 1 gal. of kerosene, 2 bottles of olives, 3 cans of corn, and 2 cans of beans. What is his bill to date?

6. Mrs. F. P. Grant, who owed $3.75, received 1 pkg. of currants, 1 can of cocoa, $1\frac{1}{2}$ lb. of cheese, $3\frac{1}{2}$ lb. of 38-cent butter, and 3 lb. of corn meal. What is her bill to date?

7. Austin Thomas, who owed $1.69, received 8 lb. of corn meal, 10 lb. of sugar, 1 lb. 4 oz. of 32-cent cheese, and 2 bottles of olive oil. What is his bill to date?

8. Miss L. Hapgood, who owed $4.19, received 2 bottles of olives, $\frac{1}{2}$ lb. of coffee, 3 cans of corn, and 1 lb. 4 oz. of 40-cent butter. What is her bill to date?

9. Arthur Shores, who owed $5.07, received 1 pkg. of toasted corn flakes, 2 pkg. of malt breakfast food, and 1 lb. of 38-cent butter. What is his bill to date?

10. Miss Mary Willis, who owed $18.64, received $1\frac{1}{2}$ doz. eggs, 5 lb. of corn meal, 1 gal. of kerosene, 2 lb. 4 oz. of 40-cent butter. What is her bill to date?

11. W. H. Scott, who owed $14.02, received 3 pkg. of malt breakfast food, 1 can of C. & S. coffee, 6 cans of sardines, 2 cans of corn, and 3 cans of beans. What is his bill to date?

SALESMEN'S CARDS

The following forms show the front and the back of the card which the driver of a grocery delivery wagon carries in his book of sale slips. Some of the customers who run weekly or monthly accounts live far from the store, and instead of paying the bookkeeper, they pay the delivery clerk every week or month and receive a credit slip. He notes any such payments with the name of the customer under the head "Received on Acct."

Other customers pay when the goods are delivered, and the clerk notes such amounts under "Received Cash." If he buys eggs or vegetables from the farmers on his route, he notes the amount paid for them under "Paid Out."

1. Find the amount of each column as shown on the front of Mr. Kane's daily cash card following:

[FRONT]

Salesman *W. Kane* **Date** *May 13*, **191***6*

NAME	Received On Acct.		Received Cash		Paid Out	
O. B. White	*10*	*00*	*1*	*70*		*24*
			2	*15*		
H. O. Joslyn	*5*	*50*	*1*	*61*	*1*	*14*
				85		
T. H. Smith	*15*	*00*		*47*		*56*
			1	*02*		
			1	*54*		
			2	*16*		
			1	*50*		
				75		
			2	*14*	*1*	*90*
			1	*25*		
				50		
			1	*43*		
				39		
			1	*22*		*63*
				87		
				94		
			1	*05*		
			2	*01*		
			1	*17*	*1*	*10*
				95		
			1	*14*		
			2	*06*		
			1	*15*		
Carried Forward	?	?	?	?	?	?

If the driver has a long route, he may fill both sides of his card (or even two cards). When he has filled any of the columns on the front of the card, he adds each column, placing the sums at the bottom. Each sum is then written at the top of the corresponding column on the back. This is called "carrying the amount forward."

2. Fill in the amounts "brought forward" and add each column on the back of the card as shown below.

3. Add "**aa**" and "bb" to get all that the salesman **took in.** Then subtract "cc," which he **paid out.** How much does it leave?

4. When the driver started out in the morning, his change bag contained $2.17 in small change. How much should there be in it at night when he hands it to the bookkeeper?

[BACK]

Salesman *W. Kane* **Date** *May 13*, **191***6*

NAME	Received on Account		Received Cash		Paid Out	
Brought forward	?	?	?	?	?	?
O. B. Jones	*5*	*20*	*1*	*23*		*25*
			1	*17*		
E. L. Howes	*4*	*65*		*94*		*72*
				28		
				15		
			1	*13*		
			1	*80*		
				14		
			1	*60*		
				57		
			2	*80*		
				75		
			1	*03*		
			2	*16*		
			1	*15*		
Total	a	a	b	b	c	c

5. Complete both sides of the following total card:

[FRONT]

Salesman *W. Kane* **Date** *May 15,* **191** *6*

NAME	Received on Account		Received Cash		Paid Out	
			1	*14*		*45*
H. A. Jones	*15*	*50*		*93*		
			1	*06*	*1*	*12*
			2	*41*		
T. H. Hood	*3*	*75*		*46*		
				83	*1*	*16*
			1	*21*		
				47		*90*
			1	*05*		
			2	*06*		
				94		
A. B. Stone	*2*	*90*		*17*		
			1	*08*		
			2	*46*		
Carried forward	?	?	?	?	?	?

[BACK]

Salesman *W. Kane* **Date** *May 15,* **191** *6*

NAME	Received on Account		Received Cash		Paid Out	
Brought forward	?	?	?	?	?	?
			1	*42*		
H. H. Poole	*12*	*25*	*2*	*14*	*2*	*40*
			3	*08*		
				97		
B. S. Bowles	*5*	*80*	*1*	*26*	*1*	*60*
				45		
				14		
			1	*07*	*2*	*80*
H. R. Thompson	*10*	*00*		*96*		
			1	*13*		
				07		
			1	*09*		
				24		
Total	?	?	?	?	?	?

SELLING ON COMMISSION

Alvan R. Keen takes orders for a cash market in the city. He drives through a certain suburban section each day, and the orders which he brings in at night are put up and delivered the next day. The Company furnishes him with a horse and buggy and pays him 3 % on the amount of the day's orders. The amount of each order taken through the day is credited to him by the cashier after the goods have been weighed and the sale slips are completed.

Each of the following cards shows his work for the dates indicated. Find the amount of each day's sales and compute each day's pay or commission :

1.

SUBURBAN

Order Clerk *A. R. Keen*

Date *June 7, 1916*

Route *No. 2*

AMOUNT OF SALES AS PER SALE SLIPS

1	60	*	*	*	*
2	85	4	20	2	90
	97	1	87	1	75
1	23	1	19	1	46
1	67		85	1	13
	48	3	10	2	84
1	14	1	86	1	70
	92	1	42	2	18
1	25		93	1	46
2	34	1	18	1	29
5	18	2	64	2	80
1	14	1	52	3	26
2	90	1	58	2	40
			Total		

* The total of the preceding column should be written here.

2.

SUBURBAN

Order Clerk *A. R. Keen*
Date *June 8, 1916*
Route *No. 3*

AMOUNT OF SALES AS PER SALE SLIPS

1	34	*	*	*	*	*	*		
1	48	1	29	1	85	1	03		
2	48	1	47	1	86	1	58		
3	97	2	63	1	64	2	49		
2	64	4	82	2	48	2	43		
1	04	1	29	2	87	1	38		
1	09	2	48	3	74	1	47		
1	38	1	04	1	07	1	62		
1	86	2	95	1	48	1	04		
1	73	2	69	1	57	1	04		
2	49	1	63	2	69	2	59		
							Total		

3.

SUBURBAN

Order Clerk *A. R. Keen*
Date *June 9, 1916*
Route *No. 2*

AMOUNT OF SALES AS PER SALE SLIPS

2	50	*	*	*	*	*	*	*	*
1	35	1	27	1	59	2	98	2	38
1	32	1	97	2	45	1	45		94
	96	2	65	3	00	1	64	3	28
1	64	1	04	2	56	1	06	2	75
2	68	1	38	1	09	2	58	1	04
	84	1	47	2	68	3	24	1	00
1	05	3	24	1	04	2	79	1	64
2	69	2	69	1	53	1	24	1	06
2	05	1	06	1	08		56	2	59
1	28	1	02	1	52	1	37	3	84
							Total		

*** Bring forward the amount of the preceding column.**

BILLS

The sale slip is usually made out in pencil, without much care as to appearance. It accompanies small purchases in retail stores, being inserted in the bundle and given to the customer. When the purchase is of considerable value, as in the case of an automobile, a **bill** is sent, which is usually made out carefully by the bookkeeper. Bills are also made out for purchases that contain many items, as in the case of a retail dealer who buys of a wholesale house and defers payment until the goods are delivered or until the end of the month.

1. Copy the following bill, paying careful attention to the ruling, the money columns, the capitals, and the punctuation. Fill out all amounts where dashes are found:

NEW YORK, N.Y., JAN. 5, 1916

MESSRS. CURTIS & COOK
GLENDALE, N.Y.

BOUGHT OF CONSOLIDATED GROCERY SUPPLY COMPANY

1 90-lb. chest	Formosa tea	.75 *	—	—
1 90-lb. chest	English breakfast tea	.55	—	—
60 lb.	Arabian Mocha coffee	.29	—	—
50 pkg.	Old Grist Mill	.16	—	—
3 cases	Canned lima beans	1.75	—	—
2 cases	Canned peaches	3.25	—	—
			—	—

Received payment,
Jan. 10, 1916,
CONSOLIDATED GROCERY SUPPLY COMPANY
C. S. D.

* The amount indicated in this column in all bills in this book is the cost of the denomination in which the item is billed, in this case the cost of 1 lb.

When the bill on page 23 was paid, the bookkeeper receipted it, signing his own initials, and mailed it to Curtis & Cook.

2. Rule and make out bills, like the one on page 23, for the following purchases, dating to-day and receipting it 10 days later: Howard & Sanborn, Fair Oaks, N.Y., buy of the above wholesale dealers 3 bbl. of entire wheat flour @ \$7.50, $1\frac{1}{2}$ bbl. of oatmeal @ \$7.00, 40 lb. of cream of tartar @ \$.28$\frac{1}{2}$, and 3 cases of canned tomatoes @ \$1.75.

3. Kelley and O'Brien, Oakdale, N.Y., buy 3 cases of Ivory soap @ \$3.00, 4 cases of Gold Dust @ \$4.50, $\frac{1}{2}$ bbl. rolled oats @ \$6.40, and 2 cases of Grape Nuts @ \$4.05.

BOSTON, MASS., FEB. 3, 1916

MESSRS. CALKINS & KANE
GRANITEVILLE, MASS.

BOUGHT OF COBB, BATES, & YERXA

5 doz.	Royal canned corn	1.40	—	—
6 doz.	Kornlet canned corn	2.00	—	—
15 doz.	Oneida telephone peas	1.50	—	—
3 doz.	"Sifted Sweet" peas	1.35	—	—
			—	—

4. Fill out on paper the money column for the above bill.

5. Make out the bill sent by Cobb, Bates, & Yerxa to the following buyers of goods. Use present date, receipting at the end of the month.

Howe & Green, Marshport, Mass., bought 3 doz. cans wax string beans @ \$1.15, 5 doz. cans grated pineapple at \$1.35, and 4 doz. cans green gage plums @ \$3.25.

6. Dunham & Brown, Orange, Mass., bought $\frac{1}{2}$ doz. cans ox tongues @ \$10.50, $2\frac{1}{2}$ doz. jars Beechnut dried beef @ \$4, and 3 doz. cans Spanish canned olives @ \$3.25.

7. Drake & Carver, Glendale, Mass., bought 2 cases of Ivory soap @ \$4.25, 3 cases of Pyle's Pearline @ \$2.95, $2\frac{1}{2}$ doz. bottles lemon extract @ \$2, and $2\frac{1}{2}$ pk. dried green peas @ \$.90.

Fill in only the money columns in the following abbreviated bills. Compute the total amount of each:

8.

		Money Column	
$2\frac{1}{2}$ doz.	.48	—	—
$4\frac{1}{2}$ lb.	.32	—	—
$1\frac{1}{4}$ doz.	.60	—	—
$\frac{3}{4}$ doz.	1.64	—	—
$2\frac{1}{4}$ lb.	.28	—	—
$4\frac{1}{3}$ doz.	.54	—	—
$\frac{1}{3}$ doz.	.72	—	—
15 lb.	.08	—	—
$1\frac{1}{6}$ doz.	.48	—	—
		—	—

9.

$\frac{3}{4}$ lb.	.32	—	—
$4\frac{3}{4}$ lb.	.48	—	—
$\frac{7}{8}$ lb.	.40	—	—
13 lb.	.05	—	—
12 lb.	.07	—	—
$\frac{15}{16}$ lb.	.48	—	—
17 lb.	.03	—	—
		—	—

10.

$\frac{7}{8}$ lb.	.48	—	—
$1\frac{1}{4}$ lb.	.32	—	—
$1\frac{5}{16}$ lb.	.32	—	—
$1\frac{1}{8}$ lb.	.24	—	—
$2\frac{3}{8}$ lb.	.16	—	—
		—	—

11.

		Money Column	
$\frac{1}{4}$ lb.	.64	—	—
$2\frac{1}{2}$ lb.	.44	—	—
$3\frac{1}{4}$ lb.	.46	—	—
$1\frac{1}{8}$ lb.	.32	—	—
26 lb.	.04	—	—
25 lb.	.03	—	—
$\frac{1}{2}$ doz.	.96	—	—
$4\frac{1}{2}$ doz.	.84	—	—
		—	—

12.

$\frac{3}{4}$ doz.	.24	—	—
$1\frac{1}{4}$ doz.	.36	—	—
21 —	.04	—	—
$\frac{5}{6}$ doz.	.30	—	—
14 —	.05	—	—
15 —	.03	—	—
$4\frac{1}{8}$ lb.	.48	—	—
		—	—

13.

$4\frac{1}{2}$ doz.	1.30	—	—
9 doz.	2.10	—	—
$5\frac{1}{2}$ doz.	.70	—	—
16 doz.	1.55	—	—
13 doz.	1.72	—	—
		—	—

CONSTRUCTION PROBLEMS

REVIEW OF FRACTIONS

1. If two boards, $5\frac{1}{2}$ in. wide and $7\frac{7}{8}$ in. wide, respectively, are placed side by side, what is the combined width?

$$\begin{array}{rl} 5\frac{1}{2} \text{ in.} = & 5\frac{4}{8} \text{ in.} \\ 7\frac{7}{8} \text{ in.} = & 7\frac{7}{8} \text{ in.} \\ \hline & \frac{11}{8} \text{ in.} = 1\frac{3}{8} \text{ in.} \\ & 1\frac{3}{8} \\ & 12 \\ \hline & 13\frac{3}{8} \text{ in.} \end{array}$$

Boards used in box mills, furniture factories, etc., come in very uneven widths. Find the combined width of each of the following pairs:

2. $3\frac{1}{8}$ in. and $5\frac{1}{2}$ in.
3. $6\frac{13}{16}$ in. and $8\frac{1}{4}$ in.
4. $3\frac{1}{2}$ in. and $11\frac{3}{8}$ in.
5. $10\frac{5}{16}$ in. and $6\frac{7}{16}$ in.
6. $8\frac{5}{8}$ in. and $9\frac{3}{4}$ in.
7. $5\frac{9}{16}$ in. and $6\frac{3}{8}$ in.
8. $4\frac{3}{16}$ in. and $7\frac{1}{8}$ in.
9. $7\frac{1}{4}$ in. and $4\frac{5}{8}$ in.
10. $9\frac{11}{16}$ in. and $5\frac{5}{8}$ in.
11. $2\frac{7}{8}$ in. and $10\frac{3}{4}$ in.
12. $4\frac{7}{16}$ in. and $7\frac{1}{2}$ in.
13. $5\frac{3}{4}$ in. and $12\frac{7}{8}$ in.

14. How wide a board will remain after sawing a strip $5\frac{7}{8}$ in. wide from a board $11\frac{1}{8}$ in. wide?

$$\begin{array}{rl} 11\frac{1}{8} \text{ in.} = & 10\frac{9}{8} \text{ in.} \\ 5\frac{7}{8} \text{ in.} = & 5\frac{7}{8} \text{ in.} \\ \hline & 5\frac{2}{8} \text{ in., or } 5\frac{1}{4} \text{ in.} \end{array}$$

How wide a board will remain:

15. After sawing a $1\frac{3}{8}$-in. strip from a $10\frac{1}{4}$-in. board?
16. After sawing a $2\frac{1}{4}$-in. strip from a $9\frac{7}{8}$-in. board?
17. After sawing a $1\frac{7}{8}$-in. strip from a $10\frac{1}{8}$-in. board?
18. After sawing a $3\frac{5}{8}$-in. strip from a $9\frac{1}{4}$-in. board?
19. After sawing a $1\frac{11}{16}$-in. strip from a $9\frac{3}{8}$-in. board?

THE SCHOOL DESK

To the Teacher. — The following lesson gives an opportunity for the pupils to make first-hand measurements without leaving their seats. All the children can be at work at the same time. No two desk tops will be made of boards of exactly the same width, so that there is an excellent opportunity for independent observation of a simple piece of construction before using the dimensions furnished in the following problems. This provides a natural lesson, requiring addition and subtraction of fractions ranging from halves to sixteenths.

If you will examine the top of your desk very carefully, you will find that two or three boards have been used to make what seems at first glance to be *one* very wide board, the width of the desk top or lid. These boards have been fitted together with great care, so that you may find it difficult to discover their edges.

A study of the grain of the wood in the accompanying sketch or on your own desk will show where the two boards come together. These boards were glued and clamped until dry and then given a smooth, hard finish.

1. Measure the length and the width of your desk, taking into consideration the curved edges. In like manner, find the width of some of the single boards used. Use your pencil and ruler, as shown by *A* and *B* in the diagram on page 27.

2. An open-box desk, like that in the sketch, has a top 24 in. long (measuring from left to right), and 16 in. wide (measuring from front to back). How long must all boards be cut? Give some reasons why the *width* of boards varies so much.*

3. The cabinet maker at work on 16-inch desks may have selected a board $12\frac{7}{8}$ in. wide throughout. How wide a board must be put with it to give the proper width?

4. Select boards to combine with each of the following to make a width of 16 in.: $2\frac{7}{8}$ in., $9\frac{5}{16}$ in., $6\frac{1}{8}$ in., $9\frac{13}{16}$ in.

5. Give the width of boards which would combine with each of the following to make a 13-inch desk top: $9\frac{1}{8}$ in., $5\frac{3}{16}$ in., $7\frac{7}{8}$ in., $3\frac{13}{16}$ in., $8\frac{9}{16}$ in., $11\frac{7}{8}$ in.

NOTE. — Boards rarely come of just the right width to make the required top; strips have to be sawed off or planed off. How can the workman economize stock?

6. If the two boards selected for a 16-inch top are $12\frac{7}{8}$ in. and $5\frac{1}{4}$ in., how much will have to be sawed or planed from one of the boards to give the proper width?

$12\frac{7}{8}$ in. + $5\frac{1}{4}$ in. = $18\frac{1}{8}$ in.; $18\frac{1}{8}$ in. − 16 in. = $2\frac{1}{8}$ in., amount to be sawed off.

7. The two boards selected for an 18-inch desk top were $11\frac{3}{4}$ in. and $9\frac{1}{8}$ in. wide. How much must be removed from one of them to leave the right width?

* Desk tops must be made from perfect lumber. Much care is exercised in cutting up to avoid knots, decayed spots, open grain, etc. At the same time, as little stock must be wasted as possible.

8. In making desks with wider tops, or with lifting lids, three boards are occasionally used. Give reasons why this is undesirable and not the usual custom.

How wide a board will have to be combined with the two in each of the following groups to make a lid 20 inches wide?

(*a*) $5\frac{3}{8}$ in. and $10\frac{1}{8}$ in.
(*b*) $7\frac{7}{8}$ in. and $9\frac{3}{4}$ in.
(*c*) $5\frac{5}{16}$ in. and $3\frac{7}{8}$ in.
(*d*) $7\frac{1}{2}$ in. and $6\frac{5}{8}$ in.
(*e*) $6\frac{3}{4}$ in. and $7\frac{1}{8}$ in.
(*f*) $4\frac{5}{8}$ in. and $5\frac{1}{16}$ in.

9. The following widths of boards are at hand: $3\frac{3}{4}$ in., $5\frac{3}{4}$ in., $6\frac{5}{8}$ in., $7\frac{1}{2}$ in., $7\frac{15}{16}$ in., $8\frac{1}{8}$ in., $8\frac{1}{4}$ in., $8\frac{3}{8}$ in., $8\frac{7}{8}$ in., $9\frac{1}{16}$ in.

Select the most economical board from the above widths to combine with each of the following in making 16-inch desk tops: (*a*) $12\frac{7}{8}$ in., (*b*) $9\frac{13}{16}$ in., (*c*) $8\frac{9}{16}$ in., (*d*) $11\frac{7}{8}$ in., (*e*) $13\frac{5}{16}$ in.

10. Decide how much will have to be removed from each of the following combinations to give exactly 16-inch tops:

(*a*) $9\frac{1}{4}$ in. and $7\frac{7}{8}$ in.
(*b*) $8\frac{3}{4}$ in. and $11\frac{1}{8}$ in.
(*c*) $8\frac{1}{2}$ in. and $10\frac{3}{8}$ in.
(*d*) $12\frac{1}{8}$ in. and $4\frac{3}{4}$ in.
(*e*) $11\frac{7}{8}$ in. and $5\frac{3}{4}$ in.
(*f*) 8 in. and $6\frac{1}{2}$ in. and $3\frac{7}{8}$ in.

11. How much must be removed from each of the following for 13-inch tops? (*a*) $7\frac{1}{4}$ in. and $8\frac{1}{8}$ in., (*b*) $9\frac{7}{8}$ in. and $5\frac{3}{8}$ in., (*c*) $4\frac{1}{4}$ in., $8\frac{1}{2}$ in., and $2\frac{1}{4}$ in., (*d*) $8\frac{1}{8}$ in. and $5\frac{1}{2}$ in.

12. If the workman has chosen a $6\frac{1}{2}$-inch board and a $10\frac{7}{8}$-inch board for the top of a 16-inch desk, how much must be removed?

13. How wide a strip must be removed from one of the boards in each of the following combinations if they are intended for 13-inch desk tops?

(*a*) $4\frac{1}{4}$ in. and $9\frac{5}{8}$ in.
(*b*) $7\frac{3}{8}$ in. and $6\frac{1}{4}$ in.
(*c*) $8\frac{1}{2}$ in. and $4\frac{7}{8}$ in.
(*d*) $5\frac{7}{8}$ in. and $7\frac{7}{8}$ in.
(*e*) $10\frac{1}{4}$ in. and $4\frac{1}{8}$ in.
(*f*) $9\frac{7}{8}$ in. and $3\frac{5}{8}$ in.

USE OF CLEATS

Fig. 1

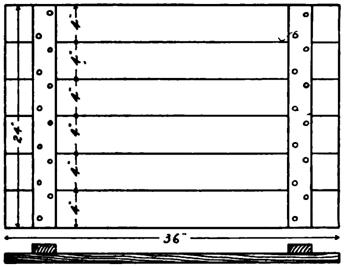


Fig. 2

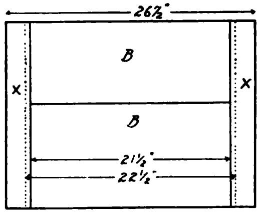


Fig. 3

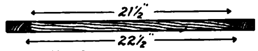


Fig. 4

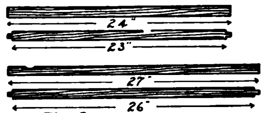


Fig. 5

Figure 1 represents the end of a board which has warped. The drying of the sap, when the green wood was exposed to the atmosphere, caused the board to shrink. Boards are sawed from logs, and the side of the board nearer the outside of the log contains more sap than the side toward the center or heart of the log. The warping is therefore away from the center.

Figure 2 shows one way of preventing warping. Two **cross cleats** are screwed firmly to the boards across the grain. This is a cheap and easy method which can be used in making box covers, storm doors, etc.

Figure 3 shows a neater and better way of preventing warping by means of **end cleats**. The ends of the center boards (*BB*) are cut so as to leave a projecting **tongue**, which fits into a **groove**, cut in the inner edge of the end cleats (*xx*). They are glued firmly together, and the inner boards are thus kept from warping. This method is used in making bread boards, desk lids, paneled doors, etc.

Study the diagram and answer the following questions:

1. A box cover like Figure 2 is made from 4-inch stock, which means boards 4 in. wide. It is to be 3 ft. long (the way the boards run) and 2 ft. wide. How many 3-foot lengths can be sawed from a 12-foot board?

2. How many of these 4-inch boards will have to be placed side by side to make the cover 2 ft. wide?

3. How many 12-foot boards must be cut up to furnish this number of 3-foot lengths? How many feet of the last board will not be used?

4. How long will the cleats have to be sawed? (If they are 2 in. wide, both can be cut from one piece of 4-inch stock.)

NOTE. — A **running foot** is 1 ft. long without regard to width.

5. How many running feet of board will it take for the cover when complete? How many 12-foot boards will be needed for the job?

6. Using the same kind of stock, construct a cover 28 in. long and 18 in. wide. Make a drawing similar to Figure 2 but use the new dimensions. Decide the number of strips needed to give the required width.

7. How much will have to be removed with a rip saw from the last strip to keep the cover exactly 18 in. wide?

8. How many running feet of board will be needed for Ex. 6, not including the cleats?

9. How many running feet will be needed to make the two cleats if sawed as in Ex. 4?

10. How many running feet will be needed in all? (Count any fraction as an extra foot.)

11. How many running feet will be required to make a similar cover 32 in. long by 20 in. wide, using 4-inch boards and 2-inch cleats?

MAKING A BREAD BOARD

1. The two middle boards used in making a bread board like that shown in Figure 3, page 30, are so wide that they would soon warp unless held flat by end cleats. If the upper face of the boards were $21\frac{1}{2}$ in. long and the cleats were each $1\frac{3}{4}$ in. wide, how long would the completed board be?

2. Compute the lengths of the following bread boards:

   (*a*) Boards $19\frac{3}{4}$ in. long on top; cleats $2\frac{1}{8}$ in. wide.
   (*b*) Boards $22\frac{1}{4}$ in. long on top; cleats $2\frac{3}{8}$ in. wide.

3. Examine Figure 4 on page 30 and see what effect cutting the tongue has on the length of the top and bottom surfaces. If a $21\frac{1}{2}$-inch board is run through a machine which cuts a $\frac{1}{2}$-inch tongue on each end, how long will it leave the *face* of the board?

4. Find the length of the face of each of the following boards after the $\frac{1}{2}$-inch tongues have been cut:

   (*a*) Original length $21\frac{3}{4}$ in.; tongues $\frac{1}{2}$ in. deep.
   (*b*) Original length $18\frac{7}{8}$ in.; tongues $\frac{3}{8}$ in. deep.

5. A workman is making bread boards all of which are to be 18 in. wide (measured across the grain). The first board which he picks up is $11\frac{7}{8}$ in. wide. How wide a board must be put with it to get the required 18 inches?

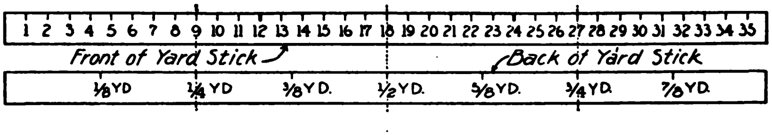
6. A workman is making bread boards 20 in. wide. What width of board must he place with each of the following?

   (*a*) $14\frac{3}{8}$ in. (*b*) $9\frac{3}{4}$ in. (*c*) $10\frac{9}{16}$ in. (*d*) $11\frac{5}{8}$ in.

7. It is not always possible to find two or three boards that will give the exact width required. How much would have to be sawed or planed from one of the boards in each of the following combinations to make bread boards 18 in. wide?

   (*a*) $8\frac{1}{2}$ in., $7\frac{1}{4}$ in., 5 in. (*b*) $7\frac{7}{8}$ in., $7\frac{1}{4}$ in., $3\frac{1}{2}$ in.
   (*c*) $5\frac{7}{8}$ in., $6\frac{5}{8}$ in., $9\frac{1}{4}$ in.

DRY-GOODS PROBLEMS



Oral Exercise

Study this sketch of the yard stick until you can express the following distances as called for:

Remember that **36 in. = 1 yd.**

1. Express 1 yd., $\frac{1}{4}$ yd., $\frac{3}{4}$ yd., $1\frac{1}{2}$ yd., $\frac{1}{8}$ yd. as inches.
2. Express 18 in., 9 in., $4\frac{1}{2}$ in., and 27 in. as parts of a yard.
3. Express $13\frac{1}{2}$ in., $22\frac{1}{2}$ in., and $31\frac{1}{2}$ in. as parts of a yard.

Compute the cost of the following:

4. 5 yd. @ \$.15	11. 2 yd. @ \$.37$\frac{1}{2}$	18. $\frac{3}{4}$ yd. @ \$.40
5. 3 yd. @ .17	12. 7 yd. @ .12	19. $\frac{1}{4}$ yd. @ .48
6. 2 yd. @ .12$\frac{1}{2}$	13. 5 yd. @ .13	20. $\frac{5}{8}$ yd. @ .40
7. 6 yd. @ .09	14. 7 yd. @ .18	21. $1\frac{1}{2}$ yd. @ .70
8. 7 yd. @ .12	15. 2 yd. @ .27	22. $\frac{1}{2}$ yd. @ .90
9. 4 yd. @ .08$\frac{1}{2}$	16. 12 yd. @ .32	23. $\frac{3}{8}$ yd. @ .48
10. 6 yd. @ .33$\frac{1}{3}$	17. 9 yd. @ .24	24. $\frac{3}{4}$ yd. @ .64

25. 1 yd. 18 in. @ \$.50	29. 3 yd. 18 in. @ \$.36
26. 1 yd. 27 in. @ .72	30. 2 yd. 27 in. @ .24
27. 1 yd. 9 in. @ .80	31. 2 yd. 9 in. @ .64
28. 2 yd. 18 in. @ .18	32. 4 yd. 18 in. @ .08

NOTE. — The sign @ means at so much a unit. Thus, 5 yd. @ \$.15 means 5 yd. at \$.15 a yard.

Oral or Written Exercise *

The following table, like those on pages 5 and 7, gives the amount purchased and the money offered by the customer in payment. Compute the charge and select the coins and bills in the proper order for making change. Examine the record for the first purchase and see if it is correct.

Copy all except the "purchase" column and fill in the items needed.

	Purchase	Cost	Customer Gives	Coins and Bills								Amt. of Change
				1¢	5¢	10¢	25¢	50¢	$1.00	$2.00	$5.00	
1.	$2\frac{1}{4}$ yd. @ $.12	$.27	$.50	3		2						$.23
2.	$1\frac{1}{2}$ yd. @ $.40		1.00	?	?	?	?	?	?	?	?	?
3.	$3\frac{1}{4}$ yd. @ $.32		2.00									?
4.	$\frac{3}{4}$ yd. @ $.16		.50									?
5.	$2\frac{3}{4}$ yd. @ $.28		1.00									?
6.	$5\frac{1}{4}$ yd. @ $.36		5.00									?
7.	$2\frac{1}{2}$ yd. @ $.20		1.00									?
8.	$1\frac{1}{2}$ yd. @ $.24		2.00									?
9.	$2\frac{1}{4}$ yd. @ $.28		1.00									?
10.	$3\frac{3}{8}$ yd. @ $.32		5.00									?
11.	$1\frac{1}{16}$ yd. @ $16		20.00									?
12.	$1\frac{3}{16}$ yd. @ $32		50.00									?
13.	$1\frac{5}{8}$ yd. @ $8		15.00									?
14.	$2\frac{3}{8}$ yd. @ $16		50.00									?
15.	$1\frac{7}{8}$ yd. @ $24		50.00									?

* This should be taken as an oral exercise if the class is fairly proficient.

16. Complete the sale slip for Mrs. Howe's purchases.

THE CENTRAL DRY GOODS CO.

ROCKLAND, ILL., JULY 5, 1916

NAME *Mrs. F. P. Howe*

ADDRESS *5 Main St.*

SOLD BY *No. 9* AMOUNT RECEIVED *$2.00*

4 yd.	*Scrim*	*.17*		
2 yd.	*Percale*	*.12½*		
½ yd.	*Satin*	*1.40*		

17. Salesman *A* made only 23 sales July 15, as shown on his total card below. Compute the value of the goods sold (both cash and charge sales). How much cash did he turn in?

DEPARTMENT *Dress Goods*

SALESMAN *A* DATE *July 15, 1916*

	CASH SALES		CHARGE SALES			CASH SALES		CHARGE SALES	
						FORWARD ?	?	FORWARD ?	?
1	*1*	*14*							
2		*38*			13	*1*	*12*		
3				*72*	14		*45*		
4	*1*	*08*			15		*38*		
5		*56*			16			*2*	*70*
6		*94*			17	*1*	*13*		
7			*1*	*50*	18	*2*	*26*		
8			*2*	*66*	19			*1*	*53*
9		*53*			20	*1*	*02*		
10		*45*			21		*96*		
11		*08*			22		*79*		
12		*19*			23			*2*	*15*
FORWARD	?	?	?	?	TOTALS	?	?		

A RECORD OF EFFICIENCY

The daily cash cards turned in to the bookkeeper each night show the amount of each clerk's daily sales. If any particular clerk regularly turns in a larger record than the others, it indicates his popularity with the customers, or a greater effort on his part, or both. Consequently, large daily sales are taken to indicate greater efficiency and are often rewarded with a larger salary.

1. In the following tables, compute each clerk's weekly sales.
2. Add horizontally and find the store's total daily sales.

WEEKLY SALES IN STORE OF BROWN & DOBEL

	MR. AMES	MISS BROWN	MISS COOK	MISS DUNN	DAILY SALES FOR THE STORE
Monday	$15.65	$14.90	$12.30	$16.84	?
Tuesday	18.35	18.24	15.62	14.12	?
Wednesday	17.60	19.16	14.91	12.97	?
Thursday	25.40	13.12	20.05	15.46	?
Friday	21.62	20.04	19.64	18.21	?
Saturday	23.18	18.74	18.02	19.46	?
Total	?	?	?	?	?

WEEKLY SALES IN STORE OF HANSON & STONE

	MISS STONE	MISS POOLE	MISS HOWE	MISS WHITE	DAILY SALES FOR THE STORE
Monday	$21.60	$19.70	$20.57	$27.60	?
Tuesday	24.85	26.30	21.72	21.46	?
Wednesday	23.72	18.46	18.96	18.88	?
Thursday	28.64	17.95	24.17	14.72	?
Friday	21.50	18.04	28.43	19.85	?
Saturday	25.35	22.78	23.89	27.99	?
Total	?	?	?	?	?

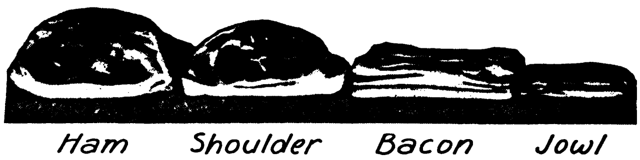
ECONOMY IN BUYING

At certain times of the year large department stores usually declare a reduced price for remnants of various lengths. If the amounts advertised are sufficient to meet the needs of a purchaser, a substantial amount can be saved by buying at this time. Find how much each customer saved on each of the following purchases.

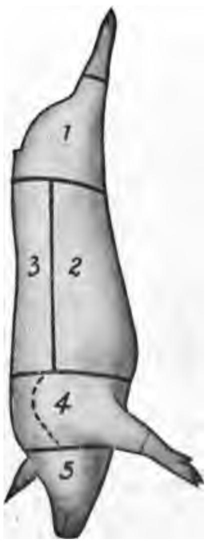
Customer Number	Goods Purchased	Yards Purchased	Former Price per yd.	Reduced Price per yd.	Amount Saved per yd.	Total Amount Saved
1.	White voile	15	$1.00	$ .50	?	?
2.	Brocade French satin	12½	2.00	1.65	?	?
3.	40-inch brocade velvet	15¼	4.00	2.50	?	?
4.	54-inch brown voile	5	3.50	1.25	?	?
5.	40-inch cashmere	5½	1.50	.75	?	?
6.	White liberty satin	4¾	2.00	1.10	?	?
7.	White cashmere de soie	3¾	2.00	1.25	?	?
8.	Crepe de chine	4¾	2.50	1.00	?	?
9.	French foulard	11	2.00	.90	?	?
10.	Taffeta silk	27	2.00	1.25	?	?
11.	Black broadcloth	11½	2.50	1.50	?	?
12.	Black poplin	18	1.00	.75	?	?
13.	Imported broadcloth	7½	4.00	2.65	?	?
14.	Black serge	8¼	2.00	1.50	?	?
15.	Storm serge	13	2.00	1.20	?	?
16.	All-worsted serge	5	2.50	1.40	?	?
17.	Scotch suiting	17	2.00	1.15	?	?
18.	Silk and wool crepe	5	1.50	1.00	?	?
19.	Silk and wool poplin	6½	2.50	1.65	?	?
20.	All-wool bengaline	8	2.50	1.40	?	?
21.	56-inch covert cloth	12	3.00	2.35	?	?
22.	Diagonal suiting	4	2.30	1.00	?	?
23.	Irish crochet lace, 2-inch	4½	1.25	.85	?	?
24.	Lace flouncing	19½	1.75	.75	?	?
25.	Lace insertion	8	1.50	.75	?	?

MEAT MARKET PROBLEMS

SELLING PORK



Study the cuts of pork as indicated on the "side" represented below. The corresponding numbers, in the picture above, show how four of the cuts look when ready to retail.



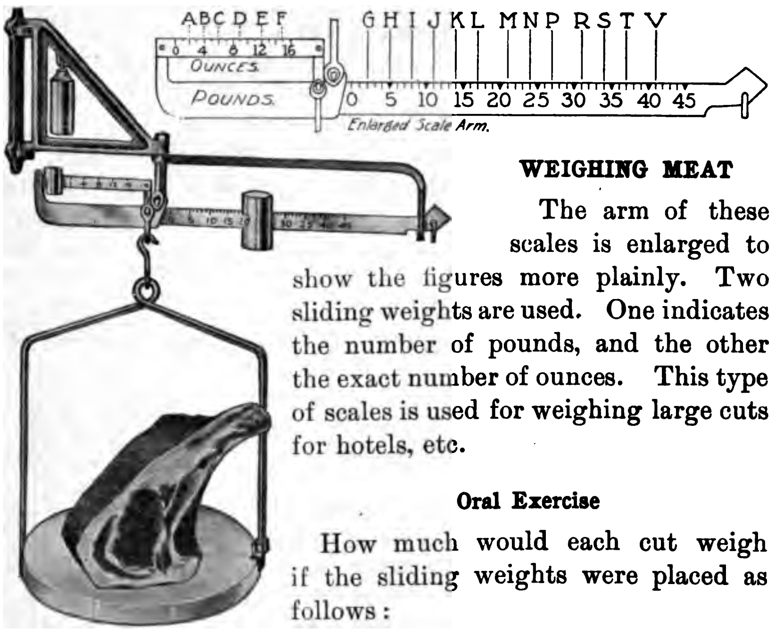
Oral Exercise

Compute the charges on the following purchases and make change, giving coins in the order of selection from the cash drawer.

Remember that:

16 ounces (16 oz.) equal 1 pound (1 lb.)

	Purchase	Price per Pound	Money Presented
1.	1 lb. 4 oz. Pork Chops	$.24	$1.00
2.	6 lb. 8 oz. Ham	.20	2.00
3.	5 lb. 4 oz. Ribroast	.20	2.00
4.	4 lb. 12 oz. Shoulder	.16	1.00
5.	1 lb. 4 oz. Ham Steak	.28	.50
6.	12 oz. Sliced Bacon	.32	.50
7.	1 strip Bacon, 5 lb.	.30	2.00
8.	1 lb. 12 oz. Sliced Ham	.28	.50
9.	14 oz. Eng. Bacon	.32	.50
10.	2 lb. 4 oz. Loin Chops	.28	1.00
11.	1 lb. 7 oz. Salt Fat Pork	.16	1.00
12.	5 lb. 4 oz. Ham	.24	2.00
13.	3 lb. 15 oz. Shoulder	.16	1.00
14.	2 lb. 4 oz. Ham	.28	2.00
15.	1 lb. 12 oz. Bacon	.28	1.00



WEIGHING MEAT

The arm of these scales is enlarged to show the figures more plainly. Two sliding weights are used. One indicates the number of pounds, and the other the exact number of ounces. This type of scales is used for weighing large cuts for hotels, etc.

Oral Exercise

How much would each cut weigh if the sliding weights were placed as follows:

	On Long Arm	On Short Arm
1.	G	A
2.	H	B
3.	I	C
4.	J	D
5.	K	E
6.	L	F
7.	M	E
8.	N	A
9.	P	C
10.	R	B
11.	S	D
12.	T	E
13.	V	F

Written Exercise

Compute the cost of the following cuts, at prices mentioned, with sliding weights placed as follows:

	Cut	On Long Arm At	On Short Arm At
1.	Rump @ 44¢	K	A
2.	Round @ 38¢	V	E
3.	Sirloin @ 42¢	N	B
4.	Ribs @ 20¢	R	D
5.	Chuck @ 14¢	T	B
6.	Flank @ 12¢	M	A
7.	Brisket @ 14¢	J	E
8.	Neck @ 12¢	L	C
9.	Shoulder @ 18¢	P	B
10.	Shin @ 8¢	I	E

BILLING MEAT

The market clerk notes the weight of the meat in *pounds* and *ounces*. When he bills it on the sale slip, he may write it as pounds and fractions of a pound, in order to compute the price more easily. Copy the "Bill" section of the following and carry out each item as the first two have been carried out, taking the weight from the first table entitled "What the Scales Show."

	What the Scales Show	How It is Billed			
1.	5 lb. 8 oz.	$5\frac{1}{2}$ lb. Ham	$.28	1	54
2.	2 lb. 3 oz.	$2\frac{3}{16}$ lb. Sirloin	.42		92
3.	1 lb. 12 oz.	— lb. Round	.28		
4.	3 lb. 6 oz.	— lb. Lamb Shoulder	.18		
5.	2 lb. 2 oz.	— lb. Rump Steak	.38		
6.	7 lb. 6 oz.	— lb. Ham	.30		
7.	4 lb. 14 oz.	— lb. Corned Beef	.18		
8.	3 lb. 15 oz.	— lb. Shin	.08		
9.	5 lb. 4 oz.	— lb. Corned Flank	.10		
10.	15 oz.	— lb. Dried Beef	.16		
11.	6 lb. 7 oz.	— lb. Fowl	.35		
12.	1 lb. 5 oz.	— lb. Salt Pork	.14		
13.	1 lb. 7 oz.	— lb. Lamb Chops	.40		
14.	1 lb. 13 oz.	— lb. Pork Chops	.24		
15.	5 lb. 6 oz.	— lb. Spare Rib	.20		
16.	4 lb. 12 oz.	— lb. Back of Lamb	.18		
17.	2 lb. 1 oz.	— lb. Sirloin	.40		
18.	5 lb. 2 oz.	— lb. Roast Beef	.28		
19.	7 lb. 3 oz.	— lb. Roast Pork	.22		
20.	3 lb. 5 oz.	— lb. Ham	.28		
21.	8 lb. 2 oz.	— lb. Hind Quarter Lamb	.24		
22.	15 oz.	— lb. Sirloin Steak	.36		
23.	1 lb. 12 oz.	— lb. Lamb Chops	.36		
24.	2 lb. 2 oz.	— lb. Bacon	.28		

ABBREVIATED BILLING

The columns at the left of this page show the number of pounds and ounces. The "Bill Form" at the right is for practice in rapid and accurate billing. To save time, the *names* of the cuts of meat are omitted. Note carefully how the first item in Bill No. 1 is written and complete the others in a similar manner.

1.

Weight
2 lb. 4 oz.
1 lb. 8 oz.
2 lb. 1 oz.
3 lb. 2 oz.
2 lb. 3 oz.
1 lb. 4 oz.
4 lb. 5 oz.
3 lb. 6 oz.
2 lb. 7 oz.
6 lb. 8 oz.

Bill Form			
$2\frac{1}{4}$ lb.	.24		54
	.40		
	.32		
	.24		
	.32		
	.28		
	.32		
	.24		
	.16		
	.12		
Total		—	—

2.

Weight
1 lb. 9 oz.
2 lb. 10 oz.
4 lb. 11 oz.
3 lb. 12 oz.
1 lb. 13 oz.
4 lb. 14 oz.
5 lb. 15 oz.
2 lb. 8 oz.
6 lb. 12 oz.
3 lb. 4 oz.

Bill Form			
— lb.	.32		
	.40		
	.16		
	.36		
	.32		
	.24		
	.32		
	.10		
	.12		
	.16		
Total		—	—

DRIVERS' CARDS

Read the explanatory note on page 18.

The following card was made out by the driver of meat cart No. 5 sent out by the Galesburg Central Market. Each driver supplies the people on a certain route outside the regular delivery limits.

[FRONT]

GALESBURG CENTRAL MARKET

Salesman *5* **Date** *June 3,* **19** *16*

NAME	Received on Account		Received Cash		Paid Out	
			1	*80*		
			2	*16*		
			1	*94*		
E. O. Black	*5*	*00*		*56*		
				32		*74*
			1	*07*		
H. R. Lane	*4*	*75*	*2*	*14*		
			1	*18*		*36*
			1	*49*		
				86		
				75	*1*	*18*
				43		
			1	*21*		
			1	*16*		
			2	*48*		
			1	*27*		
			1	*19*		
Carried Forward	?	?	?	?	?	?

1. How much did the driver collect on outstanding accounts?
2. How much did he take in from cash sales?
3. How much did he pay out for eggs, etc.?

NOTE. — These amounts are carried forward to the top of the same columns on the back of the total card as shown on the next page.

4. What amount should be recorded at the top of the "Received on Account" column? Find the whole sum of such receipts. Where should they be written?

5. Bring forward the sum of the cash sales from the front and add the "Received Cash" column.

[BACK]

Salesman *5* **Date** *June 3,* **19** *16*

NAME	Received on Account		Received Cash		Paid Out	
Brought Forward	?	?	?	?	?	?
			3	*02*		
			1	*14*		
A. B. Brown	*4*	*70*	*2*	*07*		*45*
			1	*95*		
			4	*80*		
			1	*60*		
H. S. Shores	*12*	*50*	*1*	*24*	*1*	*02*
				96		
			1	*57*		
			1	*40*		*27*
				95		
				74		
			1	*30*		
				75		
				14		
			1	*08*		
Total	a	a	b	b	c	c

6. Find the total amount paid out through the day.

7. Add the total "Received on Account" and "Received Cash" and subtract the "Paid Out."

8. The driver took $4.85 in change when he started out. How much should he turn over to the bookkeeper at night?

9. Copy and complete the following total card, both front and back, as follows:

(*a*) Add each column on the front.

(*b*) Carry each total forward to the top of the corresponding column on the back and then add the columns on the back.

(*c*) Add the first two columns and *subtract* the total of the third column.

(*d*) How much cash should be turned in at night if the driver took $5.00 in change when he started out in the morning?

[FRONT]

SALESMAN *5* *June 4*, 19*15*

Received on Account		Received Cash		Paid Out	
			96		
			42		
4	*00*	*1*	*08*		*48*
			47		
			12		
		1	*02*		
			87		
1	*60*	*1*	*96*		
			43		*30*
			38		
			09		
12	*50*	*1*	*11*		
			14		
		1	*01*	*1*	*25*
			15		
		1	*08*		
			19		
			26		
Carried forward					
?	?	?	?	?	?

[BACK]

Received on Account		Received Cash		Paid Out	
			14		
		1	*15*		
3	*80*		*28*		
		1	*80*	*2*	*50*
		1	*00*		
			40		
			64		
5	*00*		*27*		
		1	*02*	*1*	*70*
			84		
		1	*26*		
10	*00*	*1*	*00*		
			54	*2*	*90*
		1	*05*		
			96		
?	?	?	?	?	?

POULTRY PROBLEMS

A well-known poultry expert has published facts, from which the following table was taken, showing the profit from a small flock of pullets properly fed and cared for.

YEARLY INCOME FROM A FLOCK OF 20 PULLETS

MONTH	EGGS LAID	NUMBER OF DOZEN	AVERAGE PRICE PER DOZEN	VALUE OF EGGS
Oct.	147	?	\$.44	?
Nov.	282	?	.52	?
Dec.	303	?	.43	?
Jan.	313	?	.40	?
Feb.	336	?	.36	?
Mar.	384	?	.25	?
Apr.	321	?	.22	?
May	257	?	.24	?
June	263	?	.28	?
July	267	?	.32	?
Aug.	249	?	.35	?
Sept.	199	?	.40	?

1. Take each month at a time and find the number of dozen eggs laid and their value. Compute the number of dozen mentally, but use paper in finding the value.

$$147 \text{ eggs} = 12\tfrac{1}{4} \text{ doz.}; \ 12\tfrac{1}{4} \times \$.44 = \$5.39.$$

2. Add the column headed "Eggs Laid," to find the total number of eggs laid during the year.

3. Find the average per hen by dividing this number by 20.

4. Find the value of all eggs laid by adding the amounts obtained in the first example and recorded in the last column.

5. The cost of food averaged \$1.79 per bird. What was the total food bill ? Subtract this from the total value of the eggs to get the net profit for the flock.

6. Find the average profit per fowl.

FARM ACCOUNT

Mr. Mason, being tired of factory life, wished to get into some more congenial out-door work. He bought a small farm and started to raise poultry. After two or three years of experimenting, he was able to make a very successful showing. His entire year's record is shown on the following page :

Directions for Using the Following Table

1. **January.** — Read the first line of items and tell how the facts in column *B*, *D*, and *F* were obtained.

2. **February.**

(*a*) How many dozen eggs were laid in February?

(*b*) How many dozen were left to sell @ 45 ¢?

(*c*) What was the total income received from selling eggs in February?

(*d*) What would constitute the expenses in this business? Subtract the February expense from the income to find the gain for the month.

3. In a similar manner, fill out the account for each of the other months.

4. To find the complete egg yield for the year, add column *A*.

5. Add column *B*, and check it by dividing the total for column *A* by 12. The two results should agree.

6. Obtain the total income by adding column *D*. Is this actual profit?

7. The **net gain** is the actual profit after all expenses have been paid. Obtain this by adding column *F*.

8. Check column *F* by subtracting the total of column *E* from the total of *D*. Why should they agree?

Yearly Egg Record for One Flock

(Kept by Mr. Mason for the year 1914)

Month	A Eggs Yielded	B Number of Dozen	C Sold as Follows	D Received	E Expenses for Month	F Gain
Jan.	2004	167	100 doz. @ $.50	$50.00	$30.50	$50.32
			The rest @ .46	30.82		
Feb.	2208	?	80 doz. @ .48	?	35.80	?
			38 doz. @ .46	?		
			The rest @ .45	?		
Mar.	3684	?	95 doz. @ .45	?	26.20	?
			104 doz. @ .42	?		
			The rest @ .40	?		
Apr.	3252	?	150 doz. @ .40	?	35.10	?
			75 doz. @ .38	?		
			The rest @ 36	?		
May	3144	?	180 doz. @ .35	?	30.90	?
			60 doz. @ .34	?		
			The rest @ .32	?		
June	2724	?	100 doz. @ .30	?	31.40	?
			The rest @ .25	?		
July	2124	?	90 doz. @ .25	?	40.20	?
			The rest @ .23	?		
Aug.	3372	?	200 doz. @ .24	?	30.90	?
			The rest @ .26	?		
Sept.	1848	?	120 doz. @ .28	?	32.50	?
			The rest @ .30	?		
Oct.	1572	?	90 doz. @ .30	?	32.40	?
			The rest @ .32	?		
Nov.	1344	?	75 doz. @ .34	?	31.80	?
			The rest @ .35	?		
Dec.	1740	?	80 doz. @ .40	?	25.20	?
			The rest @ .45	?		
Totals	? eggs	? doz.		?	?	?

PROFITS IN POULTRY KEEPING

A business man having some unused land in the rear of his house decided to keep some poultry to furnish his table with fresh eggs and, if possible, to add something to his income.

He was uncertain as to the best breed of fowl to buy, so he decided to build three small houses just alike, to put a different breed in each, to treat them exactly alike, and to see which paid the best. He housed them as follows:

Pen No. 1. Plymouth Rocks.
Pen No. 2. Rhode Island Reds.
Pen No. 3. White Wyandottes.

Being a business man, he knew that he could not tell whether his experiment succeeded without keeping accounts. This he did, therefore, in order to be able to answer the following questions:

Does poultry keeping pay?
Which breed pays the best?
What per cent is made on the investment?

The following table is a standard egg record. At the end of each day the eggs laid by each pen were carefully recorded. The value of the eggs used was reckoned at the price nearest the middle of each month. Rule off on paper spaces similiar to the blank spaces at the foot of page 49 and fill them in.

Daily Egg Record

Day of Month	November Prices	Pen No. 1	Pen No. 2	Pen No. 3	December Prices	Pen No. 1	Pen No. 2	Pen No. 3	January Prices	Pen No. 1	Pen No. 2	Pen No. 3
1	40¢	1	2	2	48¢	2	1	1	48¢	4	5	1
2		0	1	2		3	4	2		5	2	9
3		1	1	0		2	3	3		3	4	5
4		1	0	8		2	1	3		6	6	4
5		0	2	1		4	2	3		4	3	8
6		1	1	2		1	4	2		8	5	2
7		2	1	2		2	3	4		5	8	1
8		1	2	4		2	3	1		4	7	7
9		0	3	1		5	6	1		9	2	10
10		1	1	3		1	1	2		4	10	5
11		2	2	1		1	4	2		6	9	8
12		3	1	1		4	5	3		4	2	4
13		1	1	2		1	2	4		5	8	9
14	45¢	1	3	2	50¢	3	1	2	48¢	2	6	7
15		2	0	3		5	6	3		10	7	6
16		1	4	2		1	1	1		3	5	8
17		3	1	4		1	2	1		9	8	5
18		1	1	2		4	2	2		8	2	11
19		1	2	1		2	5	5		4	9	2
20		2	3	1		1	2	4		8	9	8
21		1	2	3		3	7	1		5	11	7
22		3	2	1		5	1	3		7	2	5
23		2	1	0		2	3	2		6	5	4
24		1	2	2		1	6	2		6	7	4
25		4	3	1		1	4	6		3	6	9
26		2	1	3		2	4	2		9	3	4
27		3	1	2		4	1	5		10	8	6
28	50¢	3	4	1	55¢	3	2	4	50¢	1	4	3
29		1	2	1		6	2	1		1	2	8
30		2	1	2		2	5	1		9	7	4
31		–	–	–		7	4	5		10	9	7
Total No. Eggs Laid		?	?	?	Total No. Eggs Laid	?	?	?	Total No. Eggs Laid	?	?	?
No. of Doz.		?	?	?	No. of Doz.	?	?	?	No. of Doz.	?	?	?
Value @ 45¢		?	?	?	Value @ 50¢	?	?	?	Value @ 48¢	?	?	?

Yearly Income

The daily egg record begun on page 49 is kept through the year. When the total for each month is found, it is recorded as in the table below, which, when completed, will give the income for the *year*.

Pupils should make a copy of this table, fill in the totals for Nov., Dec., and Jan. as found on page 49 and then copy those given below for the remaining months of the year. In finding the value of each month's eggs, count 5 mills or over as one cent and disregard less than 5 mills. Complete the table.

Total Record for Year

Month	No. of Eggs per Pen			Total No. of Eggs from 3 Pens	No. of Doz.	Average Price	Total Value
	Plymouth Rocks	Rhode Island Reds	White Wyandottes				
Nov.	*	*	*	*	*	$.45	*
Dec.	*	*	*	*	*	.50	*
Jan.	*	*	*	*	*	.48	*
Feb.	180	185	190	555	?	.40	?
Mar.	192	181	196	569	?	.36	?
Apr.	240	232	248	720	?	.28	?
May	216	205	220	641	?	.25	?
June	190	184	192	566	?	.25	?
July	191	173	165	529	?	.30	?
Aug.	198	162	160	520	?	.32	?
Sept.	170	145	134	449	?	.35	?
Oct.	153	131	126	410	?	.40	?
	?	?	?	?			?
Total per breed	Rocks	Reds	Wyandottes	Total of all breeds		Total yearly income	

* Obtain these numbers from work on page 49.

Yearly Balance Sheet

Some poultry experts maintain that from Nov. 1 to Nov. 1 is the proper time for which to keep poultry accounts. Why? Following this plan, the year-old fowls were sold to a poultry dealer on Nov. 1, the weights running as follows:

Weight of Fowl When Sold to Poultry Dealer in November

	Total
Rocks — $7\frac{1}{2}$, 7, $6\frac{1}{4}$, $5\frac{3}{4}$, 8, $8\frac{1}{4}$, $7\frac{3}{4}$, $7\frac{1}{2}$, $6\frac{3}{4}$, $7\frac{1}{2}$ lb.	? lb.
Reds — $5\frac{1}{2}$, 5, $5\frac{1}{4}$, 6, $6\frac{1}{2}$, $5\frac{3}{4}$, $6\frac{3}{4}$, 7, $6\frac{3}{4}$, $7\frac{1}{4}$, 7, $6\frac{1}{2}$ lb.	? lb.
Wyandottes — $6\frac{1}{2}$, $5\frac{3}{4}$, 6, $6\frac{1}{2}$, $6\frac{3}{4}$, 6, $6\frac{1}{2}$, 7, $6\frac{3}{4}$, 6, $5\frac{3}{4}$, $6\frac{1}{4}$ lb.	? lb.

1. Find the total weight of fowl sold.
2. Find the value of the fowl sold at $.14 a pound.

Note. — The original expenditure for houses, etc., is usually counted as permanent improvement and does not appear in the yearly account; therefore it is not given here.

Summary

Income

Value of eggs used and sold (see page 50)		?	
Value of meat sold		?	
Total income			?

Expense

Cost of 36 pullets in beginning	@ $1.25	?	
Cost of feed:			
20 bags mixed grain	@ 1.95	?	
12 bags dry mash	@ 2.15	?	
1 bag cut alfalfa	@ 2.00	?	
200 lb. shells	for	$.60	
Total expense			?
Net income			?

3. Find the total income; the total expense; the net income.

Monthly Accounts

The value of the annual poultry crop in this country is estimated at \$700,000,000. As it is largely a back-yard crop, more people are directly involved in its production than in any other single crop. Until recent years, little science or mathematics has entered into the process of poultry raising. To-day, owing to the work of the government agricultural stations, people are becoming much more interested in poultry raising as a means of supplementing the regular income.

In all accounts, it is desirable to find how the income compares with the outgo or expenses. If a business is successful for any given period, the income should exceed the expenses.

1. The next page contains the entire monthly account for a flock of fowl. At the left is the daily egg record for the flock. Find the total number of eggs laid.

2. In the center, "Income Account," is a careful record of all eggs or fowl sold. Copy this,* complete each item showing a sale of eggs, and put the amount in the egg column. Find the total income from the sale of eggs.

3. Add the amounts received from the sale of fowl. Why are these amounts placed in a separate column?

4. How much was received from both eggs and fowl?

5. The right-hand section, "Expense Account," contains a record of all money paid for food or equipment during the month. Complete the two items which are incomplete.

6. Find the sum of all payments.

7. Deduct the total expenses from the total income. The remainder is the **net gain**.

* If the teacher cannot afford time to copy this account, she may have the class rule the money columns only and record the results in proper order.

Monthly Poultry Record

Egg Record		Income Account					Expense Account		
Oct.	Eggs Laid	Income from Sales	Eggs		Fowl		Expenses		
1	50								
2	47	4 hens			4	00	100 lb. mash	2	10
3	48						100 lb. scratch	1	90
4	52	1 cockerel			2	00	25 lb. charcoal		25
5	53						120 sq. ft. wire		
6	50						@ 2½¢	?	
7	51	29 doz. @ 40¢	?						
8	62						200 lb. mash	4	00
9	58						100 lb. shells		75
10	51	14 doz. @ 42¢	?						
11	47								
12	43						100 lb. scratch	1	90
13	43	10 doz. @ 42¢	?						
14	46								
15	50	6 hens			9	00	100 lb. grit		60
16	43								
17	43	17 doz. @ 42¢	?						
18	42						100 lb. mash	2	10
19	43	1 cockerel			5	00	1 doz. hoppers		
20	50						@ 66⅔¢	?	
21	47								
22	42						100 lb. scratch	2	00
23	48						100 lb. mash	2	20
24	41	24 doz. @ 44¢	?						
25	38								
26	41	4 hens			6	00			
27	43	11 doz. @ 44¢	?						
28	37								
29	39						100 lb. mash	2	15
30	43								
31	48	14 doz. @ 44¢	?						
?	?	Rec'd for eggs	?				Total payments	?	
		Rec'd for fowl	?						
		Total receipts	?						
		Deduct exp's	?						
		Net gain	?						

A COMPARISON OF POULTRY ACCOUNTS

The following is an actual year's record of poultry income and expenses.

CASH ACCOUNT FOR FLOCK OF 53 FOWLS

1914	Eggs Laid	Value of Eggs Marketed	Value of Settings *	Value of Poultry Sold	Monthly Cash Income	Expenses
	A	*B*	*C*	*D*	*E*	*F*
Jan.	617	$19.81	$1.20	$ 1.25	?	$ 3.85
Feb.	672	18.72	0.92	2.00	?	0.85
Mar.	892	20.83	7.17	——	?	2.90
Apr.	728	15.17	5.95	2.00	?	6.42
May	650	13.54	9.52	——	?	6.33
June	612	14.88	2.07	2.60	?	15.80
July	575	14.40	0.70	1.15	?	5.15
Aug.	459	12.32	1.18	1.25	?	6.44
Sept.	349	10.18	0.40	1.98	?	27.71
Oct.	210	7.00	——	1.66	?	17.58
Nov.	143	5.37	——	43.47	?	14.35
Dec.	290	10.80	——	0.95	?	44.33
Total	?	?	?	?	?	?

* Eggs sold for hatching bring higher prices than eggs sold to the markets, and a separate record is often kept of receipts from this source.

The best way to tell how you are succeeding is to compare your results with those secured by a successful poultryman. The table on page 54 is the record of a very successful year.

Guide Questions and Problems

1. How many eggs were laid during the year by the 53 fowls? how many dozen?

2. How many eggs per hen were laid on the average?

3. Find the cash income for each month by adding columns *B*, *C*, and *D* horizontally.

4. Find the total cash income for the year by adding the column of monthly incomes (column *E*).

5. To check or verify this at the end, add vertically columns *B*, *C*, and *D* separately, and then add the three together. The sum should agree with the sum of column *E*.

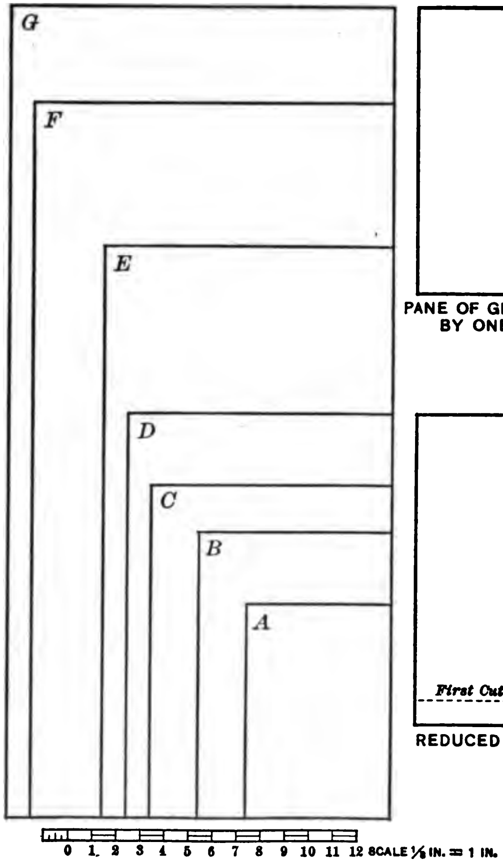
6. Find the total expenses for the year by adding column *F*.

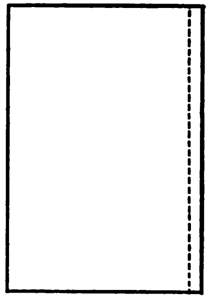
7. The increased expenses for the summer and fall months were due to raising the young stock. The value of the pullets raised over the original flock was $40.50, and the poultryman used $23.02 worth of fowls on his own table. Both of these amounts should be added to the income. What is the total?

8. Find the net profit on the flock by subtracting the total expenses from the total income as found in problem 7.

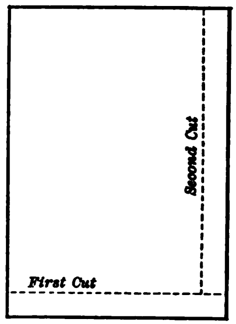
9. What is the average profit per fowl? *

* This is one of the highest records for a utility flock.





PANE OF GLASS REDUCED BY ONE CUTTING



REDUCED BY TWO CUTS

INDUSTRIAL PROBLEMS

GLASS AND GLASS CUTTING

1. The rectangles *A* to *G* represent **stock sizes** of glass drawn to a scale of $\frac{1}{8}$ inch to 1 inch. Measure the rectangles and decide the dimensions of the pane of glass that each represents.

Compute the area of each pane in square inches:

Pane A	— in. × — in.	—— sq. in.
Pane B	— in. × — in.	—— sq. in.
Pane C	— in. × — in.	—— sq. in., etc.

Stock Sizes of Glass and Retail Prices		
6″ × 7″ @ \$.03	10″ × 14″ @ \$.09	15″ × 30″ @ \$.30
6″ × 8″ @ .03	11″ × 14″ @ .11	16″ × 30″ @ .34
6″ × 9″ @ .03	11″ × 15″ @ .12	16″ × 34″ @ .38
7″ × 9″ @ .04	11″ × 17″ @ .13	16″ × 36″ @ .40
8″ × 10″ @ .05	12″ × 18″ @ .15	18″ × 34″ @ .40
8″ × 12″ @ .06	12″ × 20″ @ .17	18″ × 36″ @ .45
9″ × 12″ @ .06	12″ × 24″ @ .19	18″ × 38″ @ .50
9″ × 13″ @ .07	$13\frac{1}{2}$″ × 26″ @ .24	24″ × 26″ @ .40
10″ × 12″ @ .07	$13\frac{1}{2}$″ × 28″ @ .28	26″ × 27″ @ .50

2. Give orally the area of each pane in the first column.

3. If it were necessary to have a piece of glass $16\frac{1}{4}$ in. × $32\frac{1}{2}$ in., from which stock size would it be cut? Draw a diagram of the pane and indicate by dotted lines where cuts would be made. How many square inches would be wasted? What price would have to be charged for the resulting pane?

4. I have broken the glass front of a picture frame. It was just $15\frac{1}{4}$ in. × $28\frac{1}{2}$ in. From which of the above stock sizes would a new front be cut? Illustrate by a diagram. How many square inches would be wasted?

5. Select the stock size from which the following can be cut most economically. Illustrate each by a diagram. Compute the amount of waste. Decide the cost:

(*a*) $10\frac{1}{2}$ in. × $15\frac{5}{8}$ in.
(*b*) $6\frac{1}{2}$ in. × $9\frac{3}{4}$ in.
(*c*) 9 in. × $13\frac{3}{4}$ in.
(*d*) 24 in. × $11\frac{1}{2}$ in.
(*e*) 25 in. × 13 in.
(*f*) $16\frac{3}{8}$ in. × 10 in.

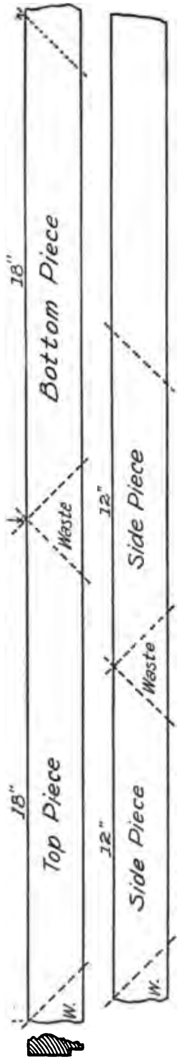


Fig. 1. Strips of Molding

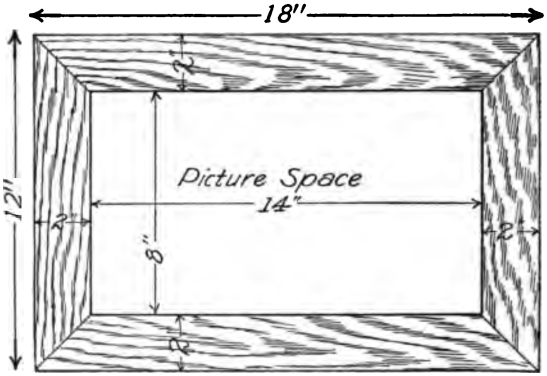


Fig. 2. Front of Frame

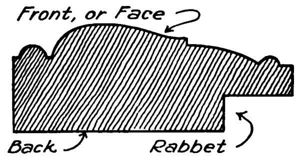


Fig. 3. Cross Section of Molding

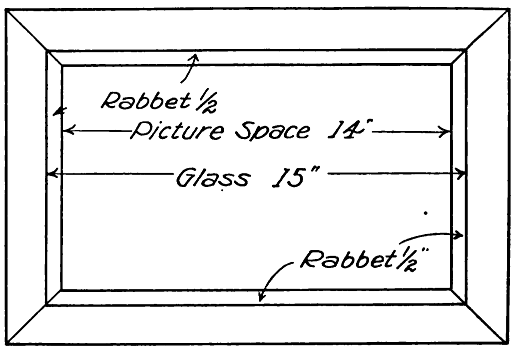


Fig. 4. Back of Frame

MAKING PICTURE FRAMES

Figure 1 represents strips of molding which are to be made up into a picture frame. The broken lines show where the molding is to be cut, and the pieces marked "waste" are wasted.

Find out what you can about the use of a **miter box** and the making of picture frames.

1. Hold your paper with the long edges at top and bottom, and draw near the top a strip of molding from which the frame shown in Fig. 2 is to be cut. Mark it to show the method of cutting. Mark the dimensions along the upper edge and find how many inches are used.

2. How many feet is this? How much does it cost at $.13 per foot?

NOTE. — Although molding is sold by the foot, it is safer to make your measurements in inches and change them to feet.

3. Find how much molding is required for a picture frame whose outside measurements are $17\frac{1}{2}$ in. by 13 in.

$17\frac{1}{2}$ in.	Or	$2 \times 17\frac{1}{2}$ in. = 35 in.	
$17\frac{1}{2}$ in.		2×13 in. = 26 in.	
13 in.		Total 61 in.	61 in. = 5 ft. 1 in.
13 in.			
61 in.			

Sketch the frames, put on the dimensions, find the length in inches, and then express as feet and inches:

4. 14 in. × 9 in.
5. 21 in. × 16 in.
6. $15\frac{1}{2}$ in. × 12 in.
7. $11\frac{1}{4}$ in. × $9\frac{1}{2}$ in.

Find the length of molding required for picture frames whose outside dimensions are given below:

8. 12 in. × 15 in.
9. 9 in. × $14\frac{1}{2}$ in.
10. $13\frac{1}{2}$ in. × 16 in.
11. $13\frac{1}{4}$ in. × $17\frac{1}{2}$ in.
12. 8 in. × $15\frac{3}{4}$ in.
13. $15\frac{1}{2}$ in. × $18\frac{3}{4}$ in.

Sketch the frames indicated by the following dimensions, mark the dimensions on the sketch, including the width of molding used. (See Fig. 2, page 58.) Find the exact size of the picture space and express it as follows: $12'' \times 16''$.

14. 8 in. by 13 in., using $1\frac{1}{4}$-inch molding.

15. 12 in. by 15 in., using $2\frac{1}{4}$-inch molding.

16. $12\frac{1}{2}$ in. by $16\frac{1}{2}$ in., using 2-inch molding.

17. Examine any fragments of picture molding which you can get, or the back of some frame in the schoolroom. Measure the depth of the **rabbet**, or bevel into which the glass front is set.

If the rabbet is $\frac{3}{8}$ in. deep and the other dimensions are as in Fig. 2, how long must the glass be to fit exactly? how wide?

14 in. + $\frac{3}{8}$ in. + $\frac{3}{8}$ in. = length of glass front.
8 in. + $\frac{3}{8}$ in. + $\frac{3}{8}$ in. = width of glass front.

18. Turn to the table on page 57 showing the stock sizes of glass and select the size from which this glass could be cut most economically.

19. If the picture space in a given frame is $10\frac{1}{2}$ in. $\times$ 15 in., and the rabbet is $\frac{1}{4}$ in. deep, find the size of glass front needed. What stock size should be bought? Make a sketch showing how it would be cut.

20. A picture frame whose outside dimensions are $21\frac{1}{2}$ in. $\times$ 15 in. is made from molding $2\frac{1}{2}$ in. wide.

(*a*) How many feet and inches of molding are used?

(*b*) How many feet and inches remain after cutting it from a 10-foot strip?

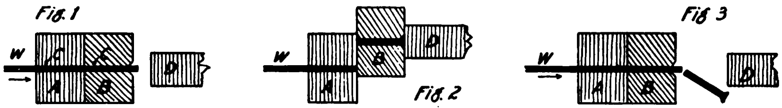
(*c*) How large is the picture space?

(*d*) How large must the glass be if the rabbet is $\frac{1}{4}$ in. deep?

(*e*) Select from page 57 the stock size from which this can be most economically obtained.

(*f*) Show by a diagram how to cut it. How many square inches are wasted?

MAKING SCREWS AND PINS



Screws and pins are all made from metal wire of appropriate sizes, cut off the right length, headed, and pointed by machinery. The machines do this work automatically; the man in charge merely feeds and oils them. One man can look after from ten to fifteen machines.

In Fig. 1, *A* is a fixed block of tempered steel; *B* is a movable block. The wire feeds in through the hole *CC*, extending a short distance beyond the face of the block *B*, which moves upward, as shown in Fig. 2, cutting the wire off the length required. At the same time a hammer *D* strikes the exposed end of the wire, forcing it into the depression in *B*, which gives shape to the head of the screw. As the block *B* shoots quickly down, the blank screw is pushed out, and more wire feeds in, ready to be cut and headed.

1. If one machine cuts and heads 90 small screws in a minute, how many does it make in 1 hour? in an 8-hour day?

2. If one man looks after 11 such machines, how many blank screws constitute his day's work?

3. Screws are sold by the gross. How many gross are turned out by this man in a day?

4. How many gross are turned out by a man who looks after 12 machines, each averaging 105 per minute?

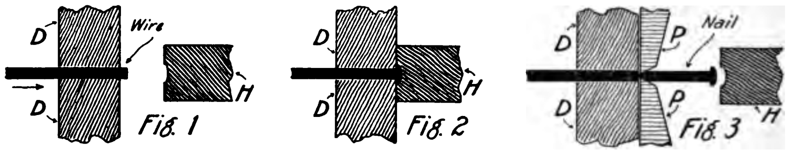
5. Compute the output of each man as follows:

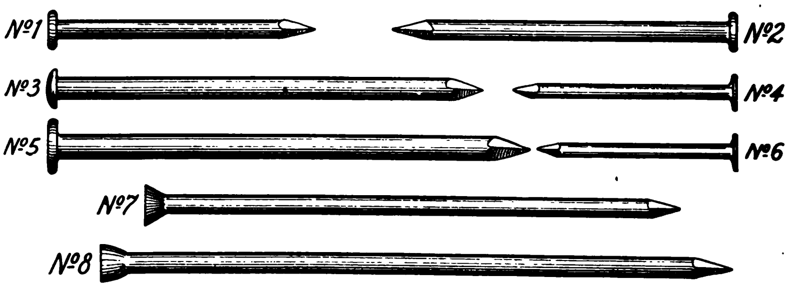
	Number of Machines	Average Number per Minute	Total per Hour	Total per Eight-hour Day	Number of Gross
Mr. Jones	9	95	?	?	?
Mr. Sampson	12	110	?	?	?
Mr. Moore	11	90	?	?	?

MAKING WIRE NAILS

In the following diagram, the three steps in heading, cutting, and pointing a nail are shown.

The wire feeds through a block, *DD*, projecting a little beyond the face as shown in Fig. 1. The hammer, *H*, descends, spreading out this projecting end and forming the head as shown in Fig. 2. As the hammer is withdrawn, two blades, *PP*, come together as shown in Fig. 3, cutting the wire and pointing the nail at one stroke.





Measure the length of each nail shown in the preceding cut, and express the results to the nearest quarter or eighth of an inch.

No. 1, a barrel nail,	? inches
No. 2, a 5d. (five-penny) shingle nail,	? inches
No. 3, a 7d. clinch nail,	? inches
No. 4, a 3d. fine nail,	? inches
No. 5, an 8d. common nail,	? inches
No. 6, a lining nail,	? inches
No. 7, a 9d. flooring nail,	? inches
No. 8, a 12d. finishing nail,	? inches

Preliminary Drill

1. Divide $1\frac{1}{2}$ ft. by $2\frac{1}{8}$ in.

   $1\frac{1}{2}$ ft. = 18 in.; $18 \div 2\frac{1}{8} = 18 \div \frac{17}{8} = 18 \times \frac{8}{17} = \frac{144}{17} = 8\frac{8}{17}$.

2. Divide $2\frac{1}{2}$ ft. by $1\frac{7}{8}$ in.
3. Divide $3\frac{1}{4}$ ft. by $2\frac{3}{8}$ in.
4. Divide 5 ft. 6 in. by $2\frac{1}{4}$ in.
5. Divide 10 ft. 3 in. by $1\frac{5}{8}$ in.
6. Divide 4 ft. 8 in. by 1 ft. 4 in.
7. Divide 2 ft. 4 in. by 1 ft. 6 in.
8. Divide 5 ft. 6 in. by 11 in.

Written Exercise

1. Notice the distance which the wire projects beyond the face of the dies, *DD*, in Fig. 1. This wire is flattened to make the head of the nail. How does the length of the wire of which one nail is made compare with the length of the resulting nail? If $\frac{1}{16}$ in. of stock (wire) is flattened into the head of the nail, what is the approximate length of wire used in making No. 6?

   1 in. + $\frac{1}{16}$ in. = $1\frac{1}{16}$ in. wire.

2. Allow $\frac{1}{16}$ in. for head stock in nails numbered 1 and 4. Find how much wire each requires.

3. Allow $\frac{1}{8}$ in. for head stock in Nos. 2, 3, and 5. How much wire does each require?

4. Allow $\frac{3}{16}$ in. in Nos. 7 and 8. How much wire does each require?

5. Allowing $1\frac{1}{16}$ in. of wire for each nail, how many nails will 1 ft. of wire make? (In determining the number of nails, express fractional remainders as decimals to the nearest tenth.)

6. Allowing $\frac{1}{16}$ in. for head stock in No. 4, what is the total length of wire required for each nail? How many such nails will 1 ft. of wire make?

7. Nails the size of No. 2 require about $\frac{1}{8}$ in. of wire for the head. Compute the length of wire per nail and the number of nails per foot.

8. It takes 44 ft. of the wire of which No. 1 is made to weigh 1 lb. How much does a mile of such wire weigh?

9. One pound of wire for making No. 6 contains 129 feet. How much does a mile of this weigh?

10. If 1 pound of wire for No. 4 contains 73 feet, and 10.1 nails are made from every foot of it, how many nails does a pound of wire make?

11. Allowing $\frac{1}{8}$ in. for head stock in No. 2, how many nails can be made from 1 lb. of wire if it averages 34 ft. to the pound?

12. Allow $\frac{3}{16}$ in. for head stock in No. 3 and compute the length of wire per nail and the number of nails per foot of wire.

13. If 26 ft. of No. 3 wire weigh one pound, compute the weight of a mile of such stock wound on a reel ready for cutting.

14. How many No. 3 nails will the mile of wire produce? (Use last answer of problem 12.)

NOTE. — When the nail is pointed as shown in Fig. 3, some of the metal is wasted. Consider this to be about 3% of the entire weight of the wire used for each nail.

15. A mile of a certain wire weighs 203 lb. before it is cut. How many pounds are lost in cutting?

16. How much do the finished nails weigh?

17. If a reel carries 125 lb. of wire, how many pounds of it are wasted? How many pounds of nails will there be?

18. If a reel carries 150 lb. of wire, how many pounds and ounces of it are wasted?

PRINTERS' PROBLEMS

CHARGES FOR STOCK PER POUND

Manila, $4\frac{3}{4}$¢	Superfine linen, $18\frac{1}{2}$¢
Common book, $3\frac{3}{4}$¢	Pure linen, $21\frac{1}{4}$¢
Plated book, $7\frac{1}{2}$¢	Cheap grade No. 1, $5\frac{3}{4}$¢
Water marked, $12\frac{1}{2}$¢	Cheap grade No. 2, $6\frac{3}{4}$¢
Fine linen, $13\frac{1}{2}$¢	Cheap grade No. 3, $8\frac{1}{2}$¢

What is the cost of the paper used on the following jobs:

1. Job No. 200 — 16 lb. of common book paper.
2. Job No. 201 — $5\frac{1}{2}$ lb. of Manila paper.
3. Job No. 202 — 7 lb. of fine linen paper.
4. Job No. 210 — $12\frac{1}{2}$ lb. cheaper grade No. 1.

NOTE. — When paper of any kind is printed, the labor of cutting, together with waste, bring the actual cost up to a higher price than quoted above. The printer is also entitled to some profit for handling the paper. He adds 50% to the original cost of all paper used in printing, to cover the cost of handling.

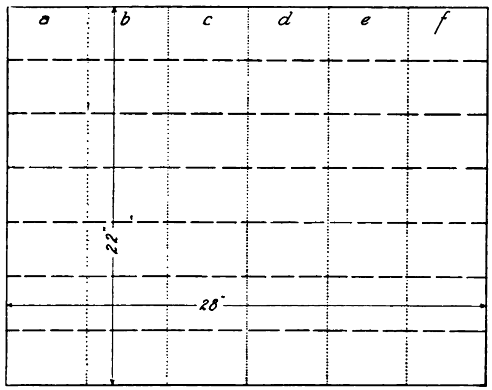
5. How much does the printer charge for 7 lb. of Manila paper if he adds 50 per cent to the wholesale cost?

Compute charges on the following:

6. $5\frac{1}{2}$ lb. of common book.
7. 25 lb. of plated book.
8. 64 lb. of water marked.
9. 20 lb. of cheap grade No. 2.
10. $5\frac{1}{4}$ lb. of cheap grade No. 3.
11. $3\frac{1}{2}$ lb. of pure linen.
12. 8 lb. of superfine linen.
13. 120 lb. of plated book.
14. 75 lb. of common book.
15. 32 lb. of water marked.

Economical Cutting Up of Stock

A printer receives an order for business cards of a specified size. The stock from which such cards are cut comes 22 in. × 28 in. The printer takes enough sheets to make the required number of cards, places them under the powerful blade of his paper cutter, and cuts as indicated by the *dotted* lines in the following diagram. Each section thus made, *a*, *b*,



Cards Cut from Stock Size of Cardboard

c, *d*, *e*, and *f*, is taken in turn and cut as indicated by the *dash* lines, giving the cards exactly as ordered. Try this, if possible, with a paper cutter.

1. If the cards ordered are to be $3\frac{1}{2}$ in. *long*, into how many sections (*a*, *b*, *c*, etc.), will *each sheet* be cut?

2. If the cards are to be $2\frac{3}{4}$ in. *wide*, into how many cards will *each section* be cut? How many cards will one sheet 22 in. × 28 in. make?

Caution. — In finding the number of cards which can be obtained from one sheet, do not divide the *area* of the sheet by that of the cards. Sometimes the 28 in. length or 22 in. width cannot be divided equally by the dimensions of the card ordered. In such cases, narrow strips are wasted.

3. How many cards $4\frac{1}{2}$ in. $\times$ 3 in. can be cut from a 28 in. $\times$ 22 in. sheet?

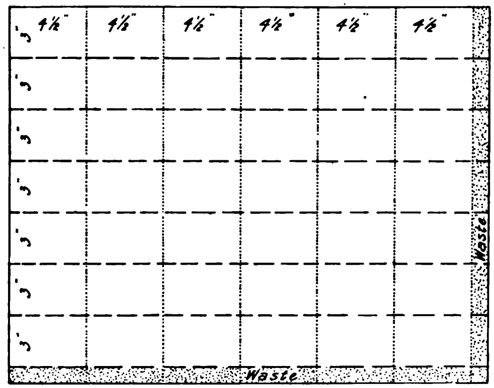
(See following diagram.)

$28 \div 4\frac{1}{2} = 28 \times \frac{2}{9} = \frac{56}{9} = 6\frac{2}{9}$.

The "6" is the number of card *lengths*, and the "$\frac{2}{9}$" is waste.

$22 \div 3 = 7\frac{1}{3}$. The "7" is the number of card *widths*, and the "$\frac{1}{3}$" is waste.

$7 \times 6 = 42$, number of cards.



4. How many cards $2\frac{1}{8}$ in. $\times$ $3\frac{1}{2}$ in. can be cut from a sheet 22 in. $\times$ 28 in.?

5. How many cards $2\frac{3}{8}$ in. $\times$ 4 in. can be cut from a sheet 22 in. $\times$ 28 in.?

6. How many cards $2\frac{1}{2}$ in. $\times$ $4\frac{5}{8}$ in. can be cut from a sheet 22 in. $\times$ 28 in.?

7. How many cards $3\frac{1}{8}$ in. by $5\frac{1}{4}$ in. can be cut from a sheet 22 in. $\times$ 28 in.?

8. Refer to the answer in problem 4 and find how many sheets are needed to supply an order for 500 such cards.

9. How many sheets of cardboard would be needed for 1000 cards like those in problem 5?

The following table contains the trade names and sizes of different grades of paper from which letter paper, billheads, etc., are cut. In order to economize stock and labor, printers select sheets which can be cut into the desired sizes without waste.

TRADE NAME	SIZE	AREA IN SQ. IN.	TRADE NAME	SIZE	AREA IN SQ. IN.
Flat letter	10″ × 16″	?	Packet folio	19″ × 24″	?
Flat packet	12″ × 19″	?	Double cap	17″ × 28″	?
Demy	16″ × 21″	?	Double royal	42″ × 38″	?
Folio	17″ × 22″	?	Medium	18″ × 23″	?
Double folio	22″ × 34″	?			

10. Fill in the missing parts of the table.

11. Commercial noteheads are $5\frac{1}{2}$ in. × $8\frac{1}{2}$ in. Draw a diagram showing how they are cut from a double folio sheet. How many can be cut from one sheet?

12. How many sheets must be cut up to make 100 noteheads?

13. Royal packet noteheads are 6 in. × $9\frac{1}{2}$ in. From which of the above sizes can they be cut without waste? Diagram each.

14. How many large sheets of flat packet must be cut up to make 1000 of these noteheads?

15. From which paper in the preceding table can $8\frac{1}{2}$ in. × 7 in. billheads be cut?

16. Find the paper from which to cut regular statements, $5\frac{1}{2}$ in. × $8\frac{1}{2}$ in., without waste.

17. I have an order for 1000 letterheads, $8\frac{1}{2}$ in. × 11 in. From which paper shall I cut it? How many sheets are needed to fill the order?

18. Answer the same questions for letterheads 8 in. × $10\frac{1}{2}$ in.; for noteheads $5\frac{3}{4}$ in. × 9 in.

BUSINESS USE OF 100, 1000, AND 2000

Weights are often expressed as **hundredweight (cwt.)**, or **100 lb.**, especially in freight dealings.

Carpenters express flooring, roofing, etc., as squares.

A square is 100 sq. ft. (C = 100 units.)

To divide by 100, move the decimal point 2 places to the left.

560 lb. = 5.6∅ cwt. 1850 sq. ft = 18.5∅ squares.

Oral Exercise

How many hundredweight are there in the following?

1. 750 lb.	**4.** 1562 lb.	**7.** 4000 lb.
2. 921 lb.	**5.** 980 lb.	**8.** 5260 lb.
3. 179 lb.	**6.** 865 lb.	**9.** 9187 lb.

How many squares are there in the following areas?

10. 5260 sq. ft.	**13.** 6400 sq. ft.	**16.** 750 sq. ft.
11. 1480 sq. ft.	**14.** 8570 sq. ft.	**17.** 1100 sq. ft.
12. 990 sq. ft.	**15.** 1060 sq. ft.	**18.** 590 sq. ft.

M = 1000 in billing goods. T. = 2000 lb.

To divide by 1000, move the decimal point 3 places to the left.

To divide by 2000, move the decimal point 3 places to the left, and divide the quotient by 2.

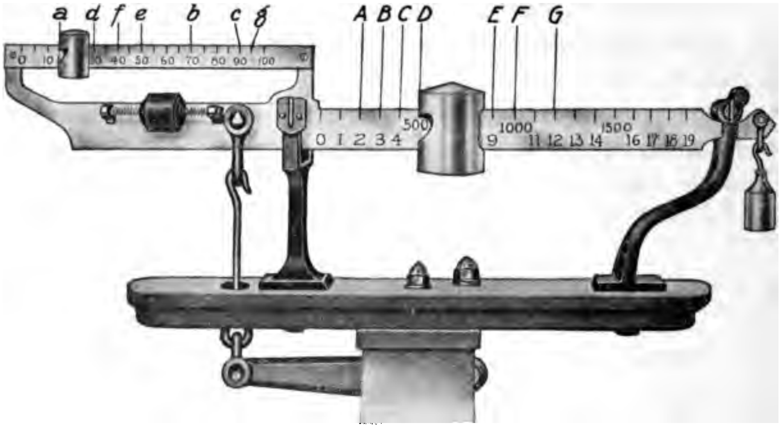
How many M (1000) are there in the following?

19. 5000 ft. lumber.	**22.** 1760 ft. lumber.	**25.** 3780 feet.
20. 7600 ft. lumber.	**23.** 2140 ft. lumber.	**26.** 2850 bands.
21. 1450 ft. lumber.	**24.** 4500 bolts.	**27.** 1289 posts.

How many T. (tons) are there in the following?

28. 4000 lb.	**31.** 5000 lb.	**34.** 6060 lb.
29. 18,000 lb.	**32.** 2840 lb.	**35.** 7000 lb.
30. 8400 lb.	**33.** 6400 lb.	**36.** 2400 lb.

WEIGHING BY THE HUNDREDWEIGHT



The long arm records *pounds* in even hundreds up to 19 cwt. and the short arm records *pounds* in even tens and fives up to 1 cwt. The above reading is 515 lb., or 5.15 cwt.

1. Give the weight indicated by each letter in the diagram if the sliding weights are each at the same letter on their respective arms, that is, at *A*, *a*, or *B*, *b*, etc.

Fill in the "scales record" below. Bill this amount on paper as shown in the "bill form" at the right.

SCALES RECORD

	LARGE ARM	SMALL ARM
2.	*A*	*e*
3.	*B*	*c*
4.	*C*	*d*
5.	*D*	*f*
6.	*E*	*a*
7.	*G*	*e*

BILL FORM

BILLING AT \$ —— PER CWT.		
—— cwt. @ \$2.00	——	——
—— cwt. @ 1.80	——	——
—— cwt. @ .90	——	——
—— cwt. @ 1.20	——	——
—— cwt. @ .70	——	——
—— cwt. @ .75	——	——
Total	——	——

BEEF PROBLEMS

BUYING BEEF AT WHOLESALE

The live weight of a steer is from 1000 lb. to 1200 lb., and a higher price is paid for the heavier animal. Three steers sold on the same date as follows:

Number 1, 1000 lb., sold for $7.40 per hundredweight.
Number 2, 1150 lb., sold for $8.25 per hundredweight.
Number 3, 1200 lb., sold for $8.35 per hundredweight.

1. How much was received for each?

2. The 1000-pound steer when dressed weighed 55% of its live weight. What was the value of its dressed weight at $18 per hundredweight?

3. What was the difference between its value on the hoof and dressed?

4. The 1150-pound steer lost 48% in dressing. What was the value of its dressed weight at $18.25 per hundredweight?

5. Compute the difference in value on the hoof and dressed.

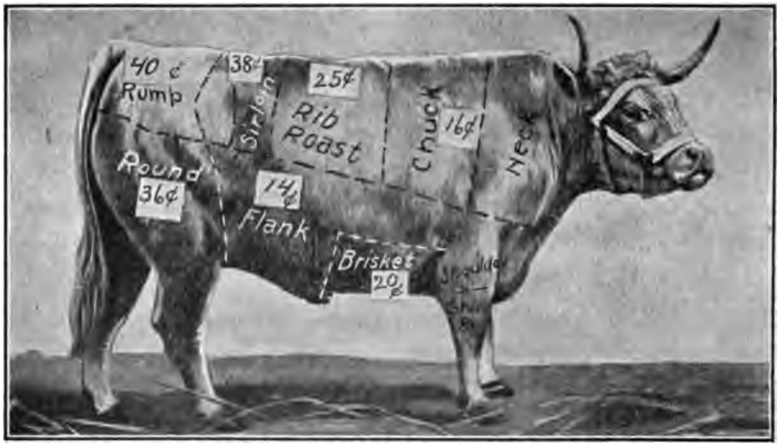
6. The 1200-pound steer shrank 43% in dressing and sold for $18.40 per hundredweight. How much did it bring?

7. How much per pound does the farmer receive for a steer which he sells at $7.50 per hundredweight? at $8.00? at $8.20? at $8.40? at $8.50?

Uses of Different Cuts of Beef (See page 72)

Rump — Excellent steaks.	**Flank** — To boil or corn.
Round, top — Cheaper steaks.	**Brisket** — Stews or to corn.
Round, bottom — Stews or pot roasts.	**Chuck** — Pot roasts.
Sirloin — Best steaks.	**Neck** — Stews or to corn.
Rib — Good roasts.	**Shoulder** — Soups.
	Shin — Soups and stews.

BUYING BEEF AT RETAIL



Study the above cut and the table on page 71 and learn to what uses the different parts are put.

NOTE.—The prices indicated in the picture are based on Boston cuts of beef. Teachers may substitute prevailing prices in their own localities.

Compute mentally the cost of the following sales:

1. 1 lb. 12 oz. Rump steak.
2. 1 lb. 4 oz. Chuck.
3. 3 lb. 8 oz. Bottom of the round (@ $.26).
4. 1 lb. 15 oz. Sirloin steak.
5. 6 lb. 4 oz. Rib roast.
6. 5 lb. 10 oz. Top of the Round (@ $.36).
7. 6 lb. 14 oz. Corned flank.
8. 5 lb. 8 oz. Corned brisket.
9. 2 lb. 6 oz. Neck (12¢).
10. 2 lb. 3 oz. Rump.
11. 1 lb. 12 oz. Chuck.
12. 2 lb. 2 oz. Sirloin.
13. 4 lb. 2 oz. Sirloin.
14. 5 lb. 6 oz. Corned flank.
15. 6 lb. 2 oz. Corned brisket.
16. 5 lb. 8 oz. Shin bone.
17. 4 lb. 3 oz. Brisket.

WHOLESALE AND RETAIL PRICES OF BEEF

1. A farmer sold an 1120-pound steer for $6.50 per hundredweight. How much did he receive for it?

2. The packer's price on the steer after it was dressed was as follows:

72 lb.	Rib	@	$.17$\frac{1}{2}$	?
130 lb.	Sirloin	@	.22	?
180 lb.	Round	@	.08$\frac{1}{2}$	?
186 lb.	Chuck	@	.08	?
95 lb.	Flank	@	.07	?
			Total	?

3. The retail butcher sold the cuts so that the average for the entire section was about as follows:

72 lb.	Rib	@	$.22	?
130 lb.	Sirloin	@	.26	?
180 lb.	Round	@	.15	?
186 lb.	Chuck	@	.13	?
95 lb.	Flank	@	.10	?
			Total	?

4. How much more did the packer receive on one steer than the farmer?

5. How much more did the butcher receive than the packer?

6. Select cuts properly trimmed cost the consumer the prices shown in the picture. This is what per cent more for each cut than the average given in problem 3?

7. If the 130 lb. of loin loses 15% in trimming, how many pounds are actually retailed? If they are sold for 38¢ per pound, how much do they bring?

RAILROAD FREIGHT PROBLEMS

Millions of dollars' worth of goods of all kinds are being moved by railroad and steamship lines every day. Every city or town that is on a railroad or a steamboat line has one or more freight stations, and thousands of clerks are engaged in keeping the records and doing the figuring necessitated by this immense traffic.

Bill of Lading

362½

UNIFORM BILL OF LADING—Standard form of Order Bill of Lading approved by the Interstate Commerce Commission by Order No. 787 of June 27, 1908.

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY

ORDER BILL OF LADING—ORIGINAL

Shipper's No. 175
Agent's No 4960

Consigned to ORDER OF A. B. Stone & Co. (Mail Address—Not for purposes of delivery)
Destination Pocasset State of Mass. County of Barnstable
Notify A. B. Stone & Co.
At Pocasset Center State of Mass. County of
Route via Middleboro Car Initial H Car No. 516

NO. PACKAGES	DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)	CLASS OR RATE	CHECK COLUMN
50	100 lb. sacks of			
	Poultry Feed	5000 lb.	8¢ per cwt.	

If charges are to be prepaid, write or stamp here, "To be Prepaid."

Received $ .... to apply in prepayment of the charges on the property described hereon.

Agent or Cashier.

Per ....
(The signature here acknowledges only the amount prepaid.)

Charges Advanced:

$ ....

Eastern Grain Co. Shipper.
Per H. A. L.

Chas. Capel Agent
Per H

(This Bill of Lading is to be signed by the Shipper and Agent of the carrier issuing same.)

The Eastern Grain Co. has received an order from A. B. Stone and Co. for 50 100-pound sacks of poultry feed to be shipped via the N. Y., N. H. & H. R. R. The Eastern Grain Co. is the **consignor** or sender of the goods and A. B. Stone & Co. the **consignee** or the company to whom the goods are sent. The bookkeeper makes out a **bill of lading**, as on page 74, which is signed by both the consignor and the freight agent.

Two *copies* are made of the original bill of lading. The *original* (see previous page) is mailed to A. B. Stone and Co., to let them know what goods have been shipped; one *copy* is filed in the office of the Eastern Grain Co. as a record that the railroad has taken the goods for shipment; the other *copy* is kept on file in the freight office as the railroad's record of shipment.

When A. B. Stone and Co. receive the bill of lading, they send it over to the freight house at Pocasset, and they obtain from the freight agent at Pocasset the goods which the bill of lading describes.

The following receipt is given by the freight agent at Pocasset to A. B. Stone and Co. on payment of the freight charges:

SECTION NO.

Form A 408

FREIGHT BILL

Pro. No. 2355

Consignee: A. B. Stone and Co.

Pocasset Station, May 16, 1916

To The New York, New Haven & Hartford Railroad Co., Dr.
FOR CHARGES ON ARTICLES TRANSPORTED

Billing Station and Route			Consignor	Connecting Line Reference
			Eastern Grain Co.	
Way-bill date	**Way-bill Number**	**Car Initials and Number**	**Original Point of Shipment**	**Original Car Initials and Number**
May 14, 1916	4960	H 516	Bridgewater	H. 516

Number of Packages, Articles and Marks	Weight	Rate	Freight	Advances	Total
50 – 100 lb. sacks Poultry feed	5000	8¢	$4.00		

All claims for loss or damage must be made on delivery.
Original paid freight bill to accompany all claims.

Received Payment for the Company May 16, 1916
Edward R. Johnson, Agent
Make Checks Payable to the Order of THE NEW YORK, NEW HAVEN & HARTFORD RAILROAD CO.

Drayage ____

COMPUTING FREIGHT CHARGES

From the preceding explanation you will see that:

Freight is billed by the hundredweight (cwt.) or 100 lb.

In order to compute the freight charges, we must express the weight of goods shipped as hundredweight, and then multiply the charge for 1 cwt. by the resulting number.

1. Find the freight charge on 470 lb. of fresh fish at 13¢ per hundredweight.

470 lb. = 4.70 cwt.
4.7 × \$.13 = \$.611, or \$ .61* freight charge.

With slight variation, all shipments are expressed on bills of lading, way bills, and other freight blanks in the order shown in the following table. Compute the freight charges:

Boston to Taunton, Mass.

	Description	Weight	Freight per Cwt.	Charges
2.	Steam heater, pipes, etc.	865 lb.	\$ .09	\$ .78
3.	Fresh fish in barrel	420 lb.	.15	?
4.	1 bbl. mackerel	340 lb.	.15	?
5.	Chairs	595 lb.	.15	?
6.	Canned goods	472 lb.	.13	?
7.	15 rolls roofing material	624 lb.	.06	?
8.	12 rolls tarred felt at 46 lb. per roll	?	.06	?
9.	Iron fittings	1260 lb.	.12	?
10.	Calfskins and sole leather	2845 lb.	.09	?
11.	14 tubs butter, 28 lb. per tub	?	.13	?
12.	9 bbl. P. cement at 400 lb. per barrel	?	.09	?
13.	26 bbl. flour at 200 lb. per barrel	?	.07	?
14.	Oranges in boxes	265 lb.	.22½	?
15.	Lime in barrel	930 lb.	.09	?
16.	Shoe findings in boxes	725 lb.	.15	?

* Consider 5 mills or over as 1 cent, and discard less than 5 mills.

LOCAL FREIGHT RATES

Boston to Middleboro, Mass.

1st class	2d class	3d class	4th class	5th class	6th class
$.21 per cwt.	$.14 per cwt.	$.12 per cwt.	$.09 per cwt.	$.08 per cwt.	$.07 per cwt.

Compute freight charges on the following goods shipped from Boston to Middleboro, the class to which each belongs being given:

	Description	Weight	Class	Charges
1.	35 100-pound sacks grain	?	4th	?
2.	Specified canned goods	346 lb.	3d	?
3.	Sugar in barrels	1070 lb.	2d	?
4.	Iron pipe	2140 lb.	4th	?
5.	Stuffed furniture	975 lb.	1st	?
6.	Foundry supplies — iron fittings	5640 lb.	3d	?
7.	Lime and cement in barrels	4185 lb.	4th	?
8.	Baled hair for plaster	3820 lb.	2d	?

DISTANT FREIGHT RATES

Boston via Pennsylvania Lines to Fair Oaks, Pa.

1st class	2d class	3d class	4th class	5th class	6th class
$.50 per cwt.	$.43 per cwt.	$.33 per cwt.	$.24 per cwt.	$.20½ per cwt.	$.17 per cwt.

Compute the charges on the following:

	Description	Weight	Class	Charges
9.	Building stone	12,480 lb.	6th	?
10.	Electrical machinery	30,000 lb.	5th	?
11.	Rolls of paper	14,800 lb.	6th	?
12.	Cases of shoes	4,960 lb.	2d	?
13.	Furniture	16,250 lb.	1st	?
14.	Gunny bags	7,280 lb.	4th	?

When any commodity is shipped in whole carloads (C. L.), the cost for each hundredweight is less than when shipped in less than whole carloads (L. C. L.). Compute the freight charges on the following carloads between the points specified:

Commodities Received in Bridgewater, Mass., by Carload

	Commodity	From	Weight	Rate per cwt.	Freight charge
1.	Grain	Philadelphia, Pa.	72,000 lb.	$.12	?
2.	Grain	Chicago, Ill.	48,000 lb.	.18	?
3.	Grain	Chicago, Ill.	51,000 lb.	.18	?
4.	Oats	Terre Haute, Ind.	40,000 lb.	.217	?
5.	Bran (in bags)	Chicago, Ill.	40,000 lb.	.127	?
6.	Oats	Milwaukee, Wis.	48,000 lb	.17	?
7.	Mill feed (bags)	Independence, Nev.	40,000 lb.	.271	?
8.	Cattle	Chicago, Ill.	20,000 lb.	.85	?
9.	Oats	Chicago, lake and rail	40,000 lb.	.14	?
10.	Cotton seed meal (in bags)	Memphis, Tenn.	40,000 lb.	.31	?
11.	Ice	Boston, Mass.	60,000 lb.	.70 per 2000 lb.	?

The difference in the cost per hundredweight of shipping L. C. L. and C. L. is illustrated as follows:

Freight on wire, cables, etc., from Worcester, Mass., to Rochester, N. Y., in carloads costs $.16 per hundredweight, but L. C. L. costs $.20; freight to Covington, Ohio, in carloads costs $.20 per hundredweight, but L. C. L. costs $.24.

12. If a carload weighs 40,000 lb., how much is saved by shipping to Rochester in one load instead of in smaller lots?

13. How much is saved on two carloads shipped to Covington, Ohio, instead of shipping the same amount L. C. L.?

14. Grain can be shipped from Duluth, Minn., to Buffalo, N. Y., via whaleback steamers on Great Lakes at $.01¼ per bushel. By railroad it would cost 11¢. How much would the United Milling Co. save on a cargo of 240,000 bu. by shipping by water?

COMPUTING FREIGHT ON MAIL ORDERS

A large business is done by mail order houses that furnish elaborate catalogues to prospective buyers and ship furniture, interior woodwork, hardware, etc., direct to the customer from long distances. A plant situated in the hard-wood section, where labor conditions are favorable, may make a specialty of furniture and interior house finish such as doors, moldings, etc.

In buying at a distance the customer must be sure to consider the cost of freight.

Compute the freight on the following supplies shipped from Davenport, Iowa, to Springfield, Mass., at the following rates:

1st class	2d class	3d class	4th class
$1.04 per cwt.	$.91 per cwt.	$.71 per cwt.	$.51 per cwt.

	Description	Weight	Class	Charges
1.	20 pr. blinds at 25 lb. per pair	?	1st	?
2.	40 rolls building paper at 46 lb. each	?	3d	?
3.	500 ft. molding at 36 lb. per 100 ft.	?	3d	?
4.	15 doors at 32 lb. each	?	3d	?
5.	1400 ft. flooring at 2 lb. per foot	?	4th	?
6.	48 window frames at 35 lb. each	?	3d	?
7.	21 window sashes at 25 lb. each	?	1st	?
8.	10,000 laths, weight 500 lb. per 1000	?	4th	?
9.	8000 shingles, weight 160 lb. per 1000	?	2d	?
10.	16 rolls building paper at 53 lb. each	?	3d	?
11.	12 doors at 35 lb. each	?	3d	?
12.	21 window frames at 31 lb. each	?	3d	?

TRANSPORTATION OF GRAIN

As you have seen in the previous lesson, freight charges are made on the basis of hundredweight (**cwt.**).

Oral and Written Exercise

1. State the number of hundredweight in each carload recorded in the following table:

TABLE OF GRAIN SHIPMENTS

	Kind of Grain	Weight of Carload	Legal Weight of 1 Bushel
(*a*)	Barley	40,000 lb.	48 lb.
(*b*)	Shelled corn	42,000 lb.	56 lb.
(*c*)	Corn on cob	41,000 lb.	70 lb.
(*d*)	Bran	35,000 lb.	20 lb.
(*e*)	Buckwheat	45,000 lb.	48 lb.
(*f*)	Oats	40,000 lb.	32 lb.
(*g*)	Potatoes	38,000 lb.	60 lb.
(*h*)	Wheat	30,000 lb.	60 lb.

2. Find how many bushels, of the weight indicated in the table, would be contained in each carload.

3. If the freight charge for a certain distance is 16 ¢ per hundredweight, how much is the freight on one bushel in each of these carloads?

Carload (*a*) is barley weighing 48 lb. to the bushel.

The freight on 100 lb. is 16 ¢.

The freight on 1 bu., $\frac{48}{\underset{25}{\cancel{100}}}$ of $\overset{4}{\cancel{16}}$ ¢ $= \frac{192}{25}$ ¢ $= 7\frac{17}{25}$ ¢.

NOTE. — The lesson on freight gave some facts about the cost of shipping grain in carloads by water and by rail. It is interesting to learn some of the factors in determining the price of grain which the user (consumer) has to pay.

Suppose that wheat is selling at \$.83 per bushel on the farms of Wisconsin and the freight charges on a carload of 48,000 lb. from Milwaukee, Wis., to Boston are \$ .17 per hundredweight.

4. How many bushels are there in the carload if 1 bu. weighs 60 lb.? (Drop any fractional remainder.)

5. What is the freight charge for the entire carload? How much is that per bushel, expressed to the nearest cent?

6. How much will each bushel cost the merchant after he has paid the freight?

7. If wheat is retailing for \$1 per bushel, what is the merchant's profit per bushel? How much will he clear on an 800 bu. carload?

8. If the cost of unloading, sacking, and delivering is 30 % of this amount, what is the net profit on the carload?

9. Wheat purchased in Illinois, in a certain year, cost \$1.01 per bushel, delivered at the railroad. The freight to Boston was \$.18 per hundredweight on a 42,000-pound carload. How much freight did the Boston merchant pay on the entire carload?

10. How much freight, to the nearest cent, did the merchant pay per bushel? How much did each bushel cost the merchant, including the cost of freight?

11. In a certain year an Illinois farmer receives \$.55 per bushel for shelled corn. The freight from Chicago to Boston is \$.16 per hundredweight. As corn weighs 56 lb. per bushel, what is the cost of freight on each bushel?

12. How much does each bushel of corn cost the eastern wholesale dealer, including the above freight charge?

13. The merchant sells to retail dealers at a profit of \$.03 per bushel. How much does each bushel cost them? How much does the wholesale dealer make on a 700-bushel carload?

14. Two bushels of shelled corn are usually sold in a bag. How much does the bag weigh, allowing 1 lb. for the sack?

15. Allowing \$.05 for the sack, and the retail dealer's profit of \$.04 a bushel, find how much per bag the consumer pays.

16. A teamster carting grain from the elevator carries about 1 T. at a load. How many bags of corn does he pile on?

NOTE. — Allow an extra bag for a fraction of a bag, equal to or greater than ½.

17. If a bag of oats contains 2 bu. and the sack weighs about 1 lb., how many bags of oats does a teamster carry at a load?

18. How much does a 42,000-pound carload of wheat cost at \$.78 per bushel?

19. A commission merchant bought a 42,000-pound carload of wheat at \$.76 per bushel and stored it in his elevator in Chicago. It was later shipped east and \$.02½ per bushel was charged for handling and storing. The railroad charged \$.17½ per hundredweight for freight. How much did the carload cost the purchaser on its arrival in the east?

20. The Northern Elevator Co. of Lanesville, Maine, made the following deliveries and sent with each a sale slip to be delivered by the driver. If the consumer pays, the teamster receipts as in the following slip. Copy the body of this sale slip, filling in all spaces in which question marks occur.

NORTHERN ELEVATOR CO.

GRAIN, FEED, HAY, STRAW, SALT, AND POULTRY SUPPLIES

LANESVILLE, ME., March 14, 1916

ROBERT HUNTER,
75 MAIN ST., CITY

2	bags corn	$1.55	?	?
3	bu. wheat	1.08	?	?
			?	?
	Paid, Northern Elevator Co. R.			

Make out the body (omitting the heading) of the sale slip which would accompany each of the following orders:

21. To Edwin O. Bosworth, 41 Park Terrace, 2 bu. wheat @ $.98; 3 bags corn @ $1.61; 1 bag meal @ $1.48.

22. To Ray Thompson, 115 Main St., 50 lb. beef scraps @ $.03½; 2 bags dry mash @ $2.21, and 1 bale of hay weighing 250 lb. at $30 per ton.

23. To Frank R. Johnston, 76 Maple Ave., 2 bales straw weighing 260 lb. and 315 lb. at $25 per ton; 2 bu. rye @ $1.18; 1 bu. barley @ $.88.

24. To Geo. H. Beals, 561 Oak St., 5 bags seed oats @ $1.13; 2 bags feed oats @ $1.09, and 2 bags cracked corn @ $1.61.

MONTHLY STATEMENTS OF GRAIN

It often happens that a customer who buys large quantities of grain, prefers to pay at the end of the month, and requests the grain company to send him a monthly statement like the following.

Pupils may copy the entire statement and fill in all amounts, receipting the statement over their own initials as bookkeepers.

A MONTHLY STATEMENT

BREMEN, N. Y., SEPT. 1, 1915

William Crane and Son

To RURAL GRAIN ELEVATOR CO., *Dr.*

Aug.	3	5 bags dry mash	2.10	?	?		
	5	2 bags cracked corn	1.61	?	?		
		100 lb. grit			60		
	7	3 bags scratch feed	2.20	?	?		
		50 lb. beef scrap	.03½	?	?		
	12	30 lb. charcoal	.01½	?	?		
		3 bags seed oats	1.13	?	?		
	18	2 bags barley	.88	?	?		
		2 bags rye	1.20	?	?		
	22	4 bags meal	1.48	?	?		
		2 bags alfalfa	1.98	?	?		
	26	2 bu. wheat	1.03	?	?		
		2 bags corn	1.63	?	?		
						?	?

Received payment
RURAL GRAIN CO.
X. Y. Z.

REVIEW — DIVISION BY FRACTIONS

Division by fractions is a process occurring most frequently in industries dealing with wood and metal.

To divide by a fraction:

Invert the divisor and proceed as in multiplication.

1. How many $\frac{3}{4}$-inch strips can be cut from a 9-inch piece of sheet brass?

$$9 \div \frac{3}{4} = \overset{3}{\cancel{9}} \times \frac{4}{\cancel{3}} = 12. \qquad \textit{Ans. } 12 \text{ strips.}$$

2. How many $1\frac{1}{4}$-inch strips can be cut from a 10-inch piece of the same material?

$$10 \div 1\tfrac{1}{4} = 10 \div \frac{5}{4} = \overset{2}{\cancel{10}} \times \frac{4}{\cancel{5}} = 8. \qquad \textit{Ans. } 8 \text{ strips.}$$

3. How many $3\frac{3}{8}$-inch strips can be cut from a $13\frac{1}{2}$-inch strip of tin?

$$13\tfrac{1}{2} \div 3\tfrac{3}{8} = \frac{27}{2} \div \frac{27}{8} = \frac{\cancel{27}}{\cancel{2}} \times \frac{\overset{4}{\cancel{8}}}{\cancel{27}} = 4. \qquad \textit{Ans. } 4 \text{ strips.}$$

4. Divide 18 by $\frac{7}{8}$.
5. Divide 21 by $\frac{15}{16}$.
6. Divide 7 by $\frac{5}{16}$.
7. Divide 13 by $\frac{7}{12}$.
8. Divide 16 by $\frac{11}{12}$.
9. Divide 14 by $1\frac{2}{3}$.
10. Divide 7 by $1\frac{1}{8}$.
11. Divide 12 by $1\frac{3}{8}$.
12. Divide 6 by $1\frac{3}{16}$.
13. Divide 9 by $1\frac{5}{16}$.
14. Divide 13 by $1\frac{5}{8}$.
15. Divide $4\frac{1}{2}$ by $1\frac{1}{4}$.
16. Divide $8\frac{3}{4}$ by $1\frac{1}{8}$.
17. Divide $10\frac{1}{2}$ by $1\frac{3}{4}$.
18. Divide $12\frac{3}{4}$ by $2\frac{1}{8}$.
19. Divide $15\frac{1}{2}$ by $2\frac{3}{8}$.
20. Divide $12\frac{1}{2}$ by $1\frac{5}{6}$.
21. Divide $9\frac{1}{4}$ by $2\frac{1}{6}$.
22. Divide $13\frac{1}{2}$ by $2\frac{7}{8}$.
23. Divide 22 by $1\frac{5}{16}$.
24. Divide $18\frac{1}{2}$ by $2\frac{7}{8}$.
25. Divide $10\frac{1}{5}$ by $1\frac{7}{10}$.

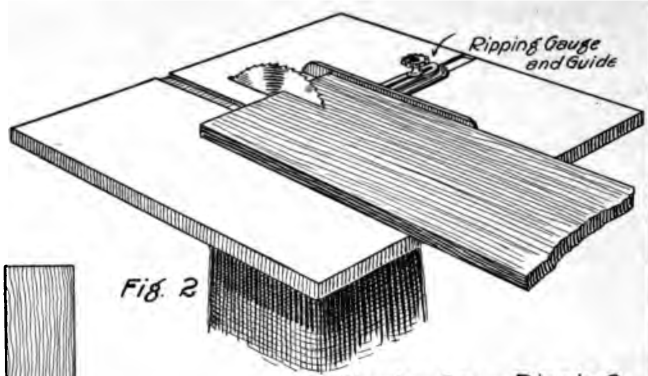


Fig. 2

Circular Saw - Ripping

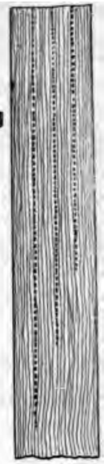


Fig. 4

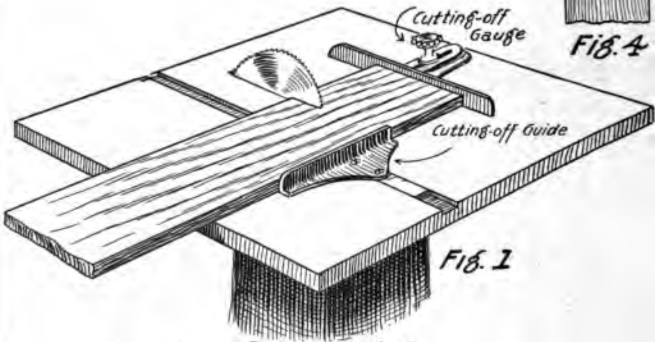


Fig. 1

Circular Saw - Cross-cutting

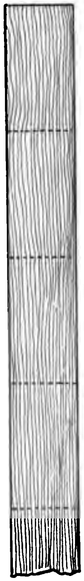


Fig. 3

Fig. 5

CARPENTRY PROBLEMS

THE MACHINE SAW

The sketches on page 86 illustrate the work of circular saws operated by machinery. The blade revolves through a slot in the bench and the boards to be sawed are pushed against it. Both cross-cut saws and rip saws are made in this style, although a great variety of sizes and styles are made.

Figure 1 shows a circular cross-cut or cutting-off saw making the first cut through a board. The dotted lines show where other cuts will be made.

Oral Exercise

1. If a 10-foot board were cut up into 2-foot lengths, as in Figs. 1 and 3, how many lengths would there be? How many times would the board have to be sawed?

2. How many 6-inch pieces could be obtained by sawing a 12-foot board in the same way? How many cuts would have to be made?

3. If you want to get 3-foot pieces and have the following length boards at hand, which should you select? Why? 8-foot, 9-foot, 10-foot, 12-foot, 14-foot.

Written Exercise

1. If a 10-foot board were cut up into 27-inch lengths, how many would be obtained? How much waste would there be?

10×12 in. $= 120$ in., length of the board.

120 in. $\div 27$ in. $= 4$ (number of lengths) with 12 in. waste.

2. All waste is to be avoided as far as possible. Find how much waste there would be if a 9-foot board were cut up into 27-inch lengths.

3. Find the number of lengths and the amount of waste in sawing up an 11-foot board into 27-inch lengths.

4. Decide which of the following boards could be sawed into 32-inch lengths with the smallest amount of waste: 12-foot, 13-foot, 14-foot boards.

RIPPING BOARDS LENGTHWISE

Examine the wood finish on your schoolroom about the doors, windows, and blackboards. You will probably find several widths of molding. These come in long strips made by sawing boards lengthwise as shown in Figs. 2 and 4 in the sketches on page 86. Ripping boards by hand is very hard work, but ripping can be done rapidly and accurately by machinery.

1. How many strips approximately * $2\frac{1}{2}$ in. wide can be cut from a 12-inch board?

$$12 \div 2\frac{1}{2} = 12 \div \frac{5}{2} = 12 \times \frac{2}{5} = \frac{24}{5} = 4\frac{4}{5}.$$

Express the answer "4 strips and waste," as the $\frac{4}{5}$ of a strip is thrown away.

2. How many $3\frac{1}{2}$-inch strips can be cut from an 11-inch board? Express the answer as above.

3. How many $1\frac{7}{8}$-inch strips can be cut from a 10-inch board? from a 12-inch board?

4. Into how many $2\frac{1}{4}$-inch strips can a 9-inch board be sawed? a 12-inch board?

5. A workman has boards at hand 8 in., 9 in., 10 in., and 12 in. wide. He has an order for $1\frac{7}{8}$-inch strips. He chooses the board which can be sawed up with the least waste. Which does he choose?

6. The following day he needs $1\frac{3}{4}$-inch strips. Which width does he choose? Why?

7. How many strips approximately $2\frac{3}{4}$ in. wide can be cut from an 11-inch board? How many boards must be cut up to give 72 strips?

8. How many 10-inch boards are required to fill an order for 50 strips $1\frac{7}{8}$ in. wide?

* The word *approximately* is used because the problems on this page do not take the *saw kerf* into consideration.

THE SAW KERF

(See Fig. 5 on page 86.)

When the saw cuts through a board, it destroys the wood in its path, grinding it into sawdust. If the saw is approximately $\frac{1}{8}$ in. thick, it will cut a **kerf** of the same width. Hence, in order to get a strip $1\frac{7}{8}$ in. wide, we use 2 in. of board.

1. How wide a strip must we allow for every $1\frac{5}{8}$-inch strip sawed with a saw which cuts a $\frac{3}{16}$-inch kerf.

2. Tell how much to allow for each strip of the following widths with a $\frac{1}{8}$-inch kerf:

$1\frac{3}{8}$ in., $2\frac{1}{2}$ in., $2\frac{3}{16}$ in., $3\frac{1}{4}$ in., $2\frac{5}{16}$ in.

3. Allow for a $\frac{1}{8}$-inch kerf and decide how many $2\frac{3}{8}$-inch moldings can be obtained from a 10-inch board.

$2\frac{3}{8}$ in. + $\frac{1}{8}$ in. = $2\frac{1}{2}$ in. (each strip); 10 in. ÷ $2\frac{1}{2}$ in. = 4 (number of strips).

4. In each of the following allow for a $\frac{1}{8}$-inch kerf and decide how many strips can be obtained from one board.

(*a*) $1\frac{3}{4}$-inch molding from a 10-inch board.
(*b*) $2\frac{1}{4}$-inch molding from an 8-inch board.

5. In order to do good work, the teeth of a saw should travel nearly 9000 ft. per minute. How many miles would this be? (Express remainder as a decimal to nearest tenth.)

6. How many feet does a saw tooth travel per second if this speed is maintained?

7. In order to secure a speed of 9000 ft. per minute, would a small saw make more or fewer revolutions than a saw whose diameter is larger?

8. If the rim of a saw is 25 in. around, how far would a tooth travel in one revolution? How many revolutions must it make to go 9000 ft.?

RIPPING BOARDS LENGTHWISE

Examine the wood finish on your schoolroom about the doors, windows, and blackboards. You will probably find several widths of molding. These come in long strips made by sawing boards lengthwise as shown in Figs. 2 and 4 in the sketches on page 86. Ripping boards by hand is very hard work, but ripping can be done rapidly and accurately by machinery.

1. How many strips approximately* $2\frac{1}{2}$ in. wide can be cut from a 12-inch board?

$$12 \div 2\tfrac{1}{2} = 12 \div \tfrac{5}{2} = 12 \times \tfrac{2}{5} = \tfrac{24}{5} = 4\tfrac{4}{5}.$$

Express the answer "4 strips and waste," as the $\frac{4}{5}$ of a strip is thrown away.

2. How many $3\frac{1}{2}$-inch strips can be cut from an 11-inch board? Express the answer as above.

3. How many $1\frac{7}{8}$-inch strips can be cut from a 10-inch board? from a 12-inch board?

4. Into how many $2\frac{1}{4}$-inch strips can a 9-inch board be sawed? a 12-inch board?

5. A workman has boards at hand 8 in., 9 in., 10 in., and 12 in. wide. He has an order for $1\frac{7}{8}$-inch strips. He chooses the board which can be sawed up with the least waste. Which does he choose?

6. The following day he needs $1\frac{3}{4}$-inch strips. Which width does he choose? Why?

7. How many strips approximately $2\frac{3}{4}$ in. wide can be cut from an 11-inch board? How many boards must be cut up to give 72 strips?

8. How many 10-inch boards are required to fill an order for 50 strips $1\frac{7}{8}$ in. wide?

* The word *approximately* is used because the problems on this page do not take the *saw kerf* into consideration.

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(See Fig. 5 on page 86.)

When the saw cuts through a board, it destroys the wood in its path, grinding it into sawdust. If the saw is approximately $\frac{1}{8}$ in. thick, it will cut a **kerf** of the same width. Hence, in order to get a strip $1\frac{7}{8}$ in. wide, we use 2 in. of board.

1. How wide a strip must we allow for every $1\frac{5}{8}$-inch strip sawed with a saw which cuts a $\frac{3}{16}$-inch kerf.

2. Tell how much to allow for each strip of the following widths with a $\frac{1}{8}$-inch kerf:

$1\frac{3}{8}$ in., $2\frac{1}{2}$ in., $2\frac{3}{16}$ in., $3\frac{1}{4}$ in., $2\frac{5}{16}$ in.

3. Allow for a $\frac{1}{8}$-inch kerf and decide how many $2\frac{3}{8}$-inch moldings can be obtained from a 10-inch board.

$2\frac{3}{8}$ in. + $\frac{1}{8}$ in. = $2\frac{1}{2}$ in. (each strip); 10 in. ÷ $2\frac{1}{2}$ in. = 4 (number of strips).

4. In each of the following allow for a $\frac{1}{8}$-inch kerf and decide how many strips can be obtained from one board.

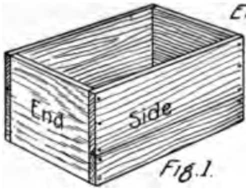
(*a*) $1\frac{3}{4}$-inch molding from a 10-inch board.
(*b*) $2\frac{1}{4}$-inch molding from an 8-inch board.

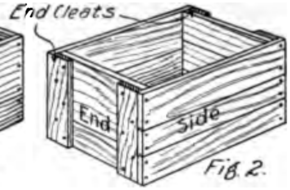
5. In order to do good work, the teeth of a saw should travel nearly 9000 ft. per minute. How many miles would this be? (Express remainder as a decimal to nearest tenth.)

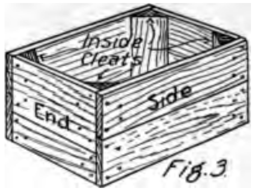
6. How many feet does a saw tooth travel per second if this speed is maintained?

7. In order to secure a speed of 9000 ft. per minute, would a small saw make more or fewer revolutions than a saw whose diameter is larger?

8. If the rim of a saw is 25 in. around, how far would a tooth travel in one revolution? How many revolutions must it make to go 9000 ft.?







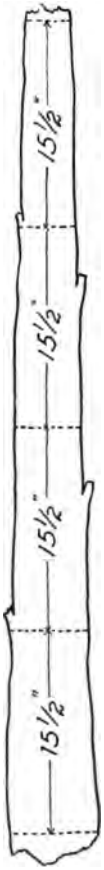


Fig. 4

WOODEN BOXES

There is no trade in which the common fractional parts of an inch are in such constant use as in box making, nor are there any simple industrial problems better adapted to show the importance of the economical cutting up and combining of material, so as to secure the greatest possible strength.

In the accompanying sketch, note whether the sides are nailed to the ends or the ends to the sides.

Which should be made of thicker boards?

Why is a cleated box stronger than one without cleats?

If a box is cleated on the inside, the sides do not have to be as long as on a box with outside cleats, but square packages would not pack readily in it. Such boxes can be used only for round cans or soft substances.

Rough boards, just as they were sawed from logs, are brought in and cut into uniform lengths for the sides or ends of the boxes which have been ordered. (See Fig. 4.)

1. How many $15\frac{1}{2}$-inch sides can be cut from a 12-foot board.*

* Any remainder must be considered as waste. The answer may be expressed in this form — "9 lengths + waste."

2. How many $13\frac{1}{4}$-inch box ends can be cut from a 12-foot board?

3. How many $23\frac{1}{2}$-inch sides can be cut from a 14-foot board?

4. How many $22\frac{3}{4}$-inch sides can be cut from a 15-foot board? Would there be much or little waste?

5. How many $14\frac{1}{2}$-inch sides can be cut from a board 13 ft. 6 in. long?

6. How many $17\frac{1}{4}$-inch ends can be cut from a board 14 ft. 4 in. long? Is there much or little waste?

7. How many 21-inch sides can be cut from a 9-foot board?

8. How many such boards must a workman cut up to get 100 of these sides?

9. What is the smallest length from which five $19\frac{3}{4}$-inch sides can be cut?

10. Boards are taken from the saw bench to the planing machine, which reduces them from $1\frac{1}{2}$ in. to $1\frac{3}{8}$ in. How much does the planer take off each side?

11. If the planer reduces the thickness of a board from $2\frac{1}{8}$ in. to $1\frac{7}{8}$ in., how much does he take from each side?

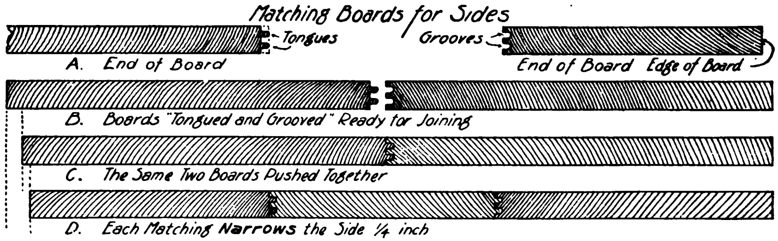
12. A lot of 12-foot boards are being sawed up into right lengths for sides and ends. Find how many boards must be sawed up for 230 sides, $23\frac{1}{2}$ in. long.

12 ft. = 144 in.

$144 \div 23\frac{1}{2} = 144 \div \frac{47}{2} = 144 \times \frac{2}{47} = \frac{288}{47} = 6\frac{6}{47}$. Therefore we can cut 6 lengths out of a 12-foot board and there will be $\frac{6}{47}$ of a length wasted. 230 = number of sides ordered. 6 = number from 1 board. $230 \div 6 = 38\frac{1}{3}$. Therefore we must cut up 38 boards and part of another, or 39 boards in all. *Ans.* 39 boards.

13. How many 12-foot boards must be sawed up for 180 ends $18\frac{3}{4}$ in. long? for 320 sides $26\frac{1}{4}$ in. long?

PLANNING THE SIDES OF BOXES



1. Certain men spend their entire time putting together boards for the sides and ends of boxes. One man sometimes spends his whole time making sides for one kind of box.

Box boards vary greatly in width. How wide a side could be made by the following three boards placed edge to edge? $5\frac{1}{2}$ in., $8\frac{1}{4}$ in., $6\frac{5}{16}$ in.

2. Most boxes are made of matched boards, that is, boards in which tongues and grooves have been cut. Study Figs. ***A***, ***B***, ***C***, and ***D*** very carefully. Which board is really narrowed, the one on the left which has been tongued, or the one on the right which has been grooved? When the tongues and grooves are $\frac{1}{4}$ in. deep and the two boards are pushed together, they will cover in all $\frac{1}{4}$ in. less space than before. In the following problems, allow for $\frac{1}{4}$-inch tongues and grooves.

3. How wide a side will the following two boards make without tonguing and grooving: $11\frac{1}{8}$ in. and $6\frac{3}{4}$ in. wide? How wide a side will they make after matching?

Compute the width of the following sets before and after matching if $\frac{1}{4}$-inch tongues and grooves are used:

4. $13\frac{3}{8}$ in. and $10\frac{5}{16}$ in. wide.

5. $9\frac{3}{4}$ in. and $7\frac{11}{16}$ in. wide.

6. $5\frac{7}{8}$ in. and $8\frac{1}{2}$ in. wide.

When three boards are put together for a side, $\frac{1}{4}$ in. must be added for each of the two matchings (Fig. *D*), because one board requires $\frac{1}{4}$ in. for each matching. How wide a side can be made from the following sets of three before and after matching?

7. $5\frac{1}{2}$ in., $6\frac{3}{4}$ in., 9 in. wide.

8. $7\frac{1}{8}$ in., $5\frac{3}{8}$ in., $7\frac{11}{16}$ in. wide.

9. $3\frac{3}{4}$ in., $4\frac{1}{2}$ in., $8\frac{1}{4}$ in. wide.

10. 4 in., $5\frac{7}{8}$ in., $3\frac{1}{4}$ in. wide.

11. Mr. A. is siding-up boxes whose sides must be just $20\frac{1}{2}$ in. wide. The boards are to be tongued and grooved after they leave his bench. How much will they lose due to matching, if three boards are used? How much must Mr. A. add to the required width ($20\frac{1}{2}$ in.)? How many inches wide must the boards be before matching if three boards are used?

If Mr. A. uses the following three boards, how much will have to be sawed from one of them to make sides like those in Ex. 11?

12. 10 in., $5\frac{1}{2}$ in., $7\frac{1}{8}$ in. wide.

13. $9\frac{1}{2}$ in., $4\frac{7}{8}$ in. $8\frac{3}{4}$ in. wide.

14. $5\frac{3}{8}$ in., 10 in., $6\frac{3}{4}$ in. wide.

15. $8\frac{1}{4}$ in., $7\frac{1}{2}$ in., $6\frac{1}{8}$ in. wide.

16. Mr. B. is making sides which must be 13 in. wide. If he uses two boards, what must be their combined width before matching?

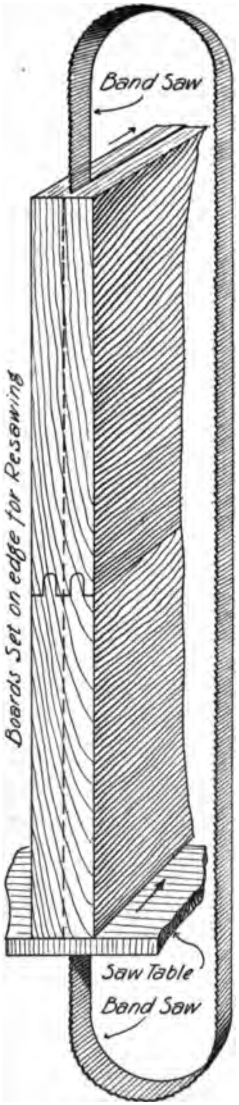
How wide a strip must be trimmed off the edge of one of them if the following widths are used?

17. $7\frac{1}{2}$ in. and $7\frac{1}{4}$ in. wide.

18. $8\frac{7}{8}$ in. and 6 in. wide.

19. $9\frac{1}{4}$ in. and $5\frac{1}{8}$ in. wide.

20. $8\frac{1}{4}$ in. and $5\frac{7}{8}$ in. wide.



Resawing to Get Both Sides of the Box from One Set of Boards

After the boards have been cut the right width for sides and ends of boxes, they are taken first to a machine which tongues and grooves them, then to a band saw which splits them lengthwise, making the *two sides or ends of a box out of one set of boards.*

1. If the boards were $1\frac{3}{8}$ in. thick before being resawed, how thick would they be afterward provided that the saw cut exactly in the center?

2. In sawing, the saw cuts and destroys its own thickness of the board, grinding it into sawdust. Subtract the thickness of this saw kerf ($\frac{1}{8}$ in.) from the original thickness of the boards and then divide by 2. How thick will the boards in Ex. 1 be?

3. If the sides to be resawed are $1\frac{1}{2}$ in. thick, and the same saw is used, how thick will the resulting sides be?

4. How thick would the sides be if the boards were $1\frac{1}{4}$ in. thick at first?

5. If the stock to be resawed is $1\frac{5}{8}$ in. thick and the saw cuts a $\frac{3}{16}$ in. kerf, how thick will each of the resulting sides be?

6. How thick will each of the sides be if cut from $\frac{7}{8}$-inch stock with a thin saw cutting a $\frac{1}{16}$-inch kerf?

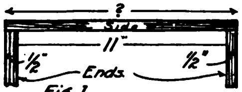


Fig. 1.

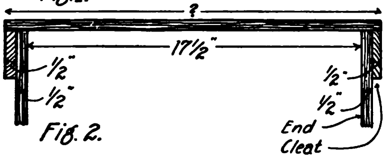


Fig. 2.

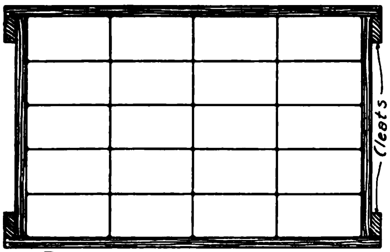


Fig. 3.
Top View of Box Cleated Outside to Allow Close Packing of Shoe Boxes
Outside Cleats Increase Strength

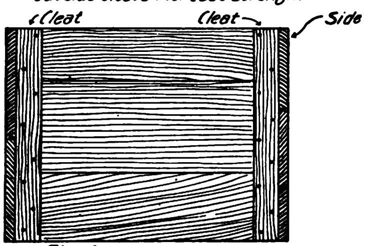


Fig. 4.
End View of Box With Outside Cleats

Planning the Length of the Sides

All orders sent to a box mill by a shoe factory or other manufacturing concern which ships its products in boxes, specify the length, the width, and the depth in exact figures to the 32d part of an inch; also the exact thickness of all stock which is used.

All dimensions for length, width, and depth are *inside* dimensions, in order to fit the contents exactly. All the following problems are taken from actual orders sent to the box mill by different manufacturers.

Oral Exercise

1. Study Fig. 1. How many inches long must the sides be if the ends are $\frac{1}{2}$ in. thick? Explain.

2. In Fig. 2, the side must be long enough to include both *ends and end cleats.* How long must the side be cut?

3. Study Fig. 3. If the inside length is 20 in., the ends are $\frac{1}{2}$ in. thick, and the cleats $\frac{1}{4}$ in. thick, how long must the side be cut?

Written Exercise

1. A plain box (without end cleats) is ordered. The inside length is to be $11\frac{1}{2}$ in. If the ends are to be $\frac{5}{8}$ in. stock (that is, $\frac{5}{8}$ in. in thickness) how long must the sides be sawed?

$11\frac{1}{2}$ in., inside length.
$1\frac{1}{4}$ in. ($2 \times \frac{5}{8}$ in.), thickness of both ends.
$12\frac{3}{4}$ in., total length of side.

Find how long the sides of the following plain boxes must be sawed:

2. Inside length, $22\frac{1}{2}$ in.; ends, $\frac{11}{16}$ in. thick.
3. Inside length, $34\frac{1}{4}$ in.; ends, $\frac{11}{16}$ in. thick.
4. Inside length, $30\frac{5}{8}$ in.; ends, $\frac{5}{8}$ in. thick.
5. Inside length, $31\frac{3}{4}$ in.; ends, $\frac{7}{8}$ in. thick.

6. Study Fig. 3, page 95, which is cleated outside. If the ends were both $\frac{3}{8}$ in. thick and the cleats $\frac{1}{2}$ in. thick, how long would the sides be sawed, provided the inside length were to be $17\frac{1}{2}$ in.?

$17\frac{1}{2}$ in., inside length.
$\frac{3}{4}$ in. ($2 \times \frac{3}{8}$ in.), thickness of both ends.
1 in. ($2 \times \frac{1}{2}$ in.), thickness of both cleats.
$19\frac{1}{4}$ in., total length of side.

How long must sides of the following boxes be cut?

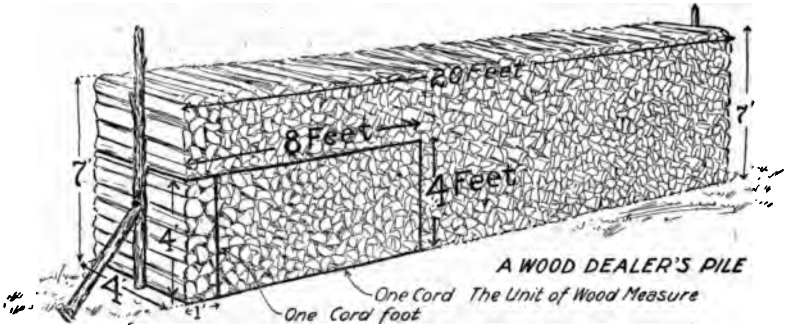
7. Inside length, $22\frac{5}{16}$ in.; ends, $\frac{3}{4}$ in. thick; outside cleats, $\frac{1}{2}$ in. thick.

8. Inside length, 28 in.; ends, $\frac{3}{4}$ in. thick; outside cleats, $\frac{5}{8}$ in. thick.

9. Inside length, $27\frac{7}{8}$ in.; ends, $\frac{11}{16}$ in. thick; outside cleats, $\frac{1}{2}$ in. thick.

10. Inside length, $24\frac{1}{8}$ in.; ends, $\frac{5}{8}$ in.; outside cleats, $\frac{1}{2}$ in. thick.

SELLING FIRE WOOD BY THE CORD



1 cord of wood is a pile of 4-foot sticks, piled 8 ft. long and 4 ft. high.

Or

1 cord of wood is any pile containing 128 cu. ft.

How to obtain the 128 cu. ft.: $4 \times 4 \times 8$ cu. ft. $= 128$ cu. ft.

How to obtain the number of cubic feet in a pile of 4-foot wood, piled 6 ft. high and 20 ft. long: $4 \times 6 \times 20$ cu. ft. $= 480$ cu. ft.

How to find the number of cords in such a pile:

$$\frac{\cancel{4} \times \overset{3}{\cancel{6}} \times \overset{5}{\cancel{20}}}{\underset{\substack{\cancel{32}\\ \cancel{16}\\ 4}}{\cancel{128}}} = \frac{15}{4} = 3\tfrac{3}{4}, \text{ number of cords.}$$

How to find the cost of a similar pile at \$6.50 per cord:

$$\frac{\cancel{4} \times \overset{3}{\cancel{6}} \times \overset{5}{\cancel{20}} \times \$\overset{3.25}{\cancel{6.50}}}{\underset{\substack{\cancel{32}\\ \cancel{16}\\ \cancel{4}\\ 2}}{\cancel{128}}} = \frac{\$48.75}{2} = \$24.37\tfrac{1}{2}, \text{ or } \$24.38$$

Compute the number of cords in the following piles:

1. 4-foot wood, piled 7 ft. high and 15 ft. long.
2. 4-foot wood, piled 8 ft. high and 30 ft. long.
3. 4-foot wood, piled 6 ft. high and 24 ft. long.
4. 4-foot wood, piled $6\frac{1}{2}$ ft. high and 30 ft. long.

Compute the cost of the following piles at prices stated:

5. 4-foot wood, 7 ft. high, 20 ft. long, at \$5.00 per cord.
6. 4-foot wood, 8 ft. high, 40 ft. long, at \$6.00 per cord.
7. 4-foot wood, 9 ft. high, 35 ft. long, at \$5.50 per cord.
8. 4-foot wood, 10 ft. high, 45 ft. long, at \$5.25 per cord.
9. 4-foot wood, 8 ft. high, 36 ft. long, at \$6.25 per cord.
10. 4-foot wood, $7\frac{1}{2}$ ft. high, 34 ft. long, at \$6.00 per cord.

Carting Wood

Cut wood is retailed in 1 cord foot (cd. ft.), 2 cd. ft., $\frac{1}{2}$ cd., and 1 cd.

1 cd. ft. contains 16 cu. ft. (See diagram on page 97.)
2 cd. ft. contain 32 cu. ft.
$\frac{1}{2}$ cord contains 64 cu. ft.

Wood is carted in wagons that differ slightly in size:

Stock Sizes of Carts and Wagons

No.	Inside Dimensions	No.	Dimensions with Sideboards in
1.	5 ft. × $3\frac{1}{2}$ ft. × 12 in. (1 ft.)	2.	5 ft. × $3\frac{1}{2}$ ft. × 2 ft.
3.	$5\frac{1}{2}$ ft. × $3\frac{1}{2}$ ft. × 12 in.	4.	$5\frac{1}{2}$ ft. × $3\frac{1}{2}$ ft. × 2 ft.
5.	$6\frac{1}{2}$ ft. × 3 ft. 10 in. × 14 in.	6.	$6\frac{1}{2}$ ft. × 3 ft. 10 in. × 28 in.
7.	$7\frac{1}{2}$ ft. × $3\frac{1}{2}$ ft. × 14 in.	8.	$7\frac{1}{2}$ ft. × $3\frac{1}{2}$ ft. × 28 in.
9.	9 ft. × $3\frac{1}{2}$ ft. × 15 in.	10.	9 ft. × $3\frac{1}{2}$ ft. × 30 in.

1. Compute the number of cubic feet in each of the carts listed on page 98. As wood does not pile compactly, fractions of a cubic foot should not be counted.

Express the work of No. 5 as follows:

$6\frac{1}{4} \times 3\frac{5}{6} \times 1\frac{1}{6} = \frac{25}{4} \times \frac{23}{6} \times \frac{7}{6} = 27\frac{137}{144}$, number of cu. ft. *Ans.* 27 cu. ft.

Express results as follows:

Cart No. 1	Cart No. 2	Cart No. 3	Cart No. 4	Cart No. 5	Cart No. 6	Cart No. 7	Cart No. 8	Cart No. 9	Cart No. 10
—— cu. ft.	—— cu. ft.	—— cu. ft.	—— cu. ft.	—— cu. ft.	—— cu. ft.	—— cu. ft.	—— cu. ft.	—— cu. ft.	—— cu. ft.

2. Which of these carts is best adapted to carry 1 cd. ft. of cut wood?

3. Which two of them are well adapted, by heaping or scanting the load, to deliver 2 cd. ft.?

4. Which are large enough to carry a half cord or more?

5. By filling any box or receptacle known to contain just $\frac{1}{2}$ cd. with wood, and then piling the contents into one of these carts and marking the height of the pile, the cart could afterward be piled up to this mark whenever $\frac{1}{2}$ cd. was ordered.

6. If a box is 5 ft. 4 in. long and 3 ft. wide, how high must it be filled to contain $\frac{1}{2}$ cd.?

> $\frac{1}{2}$ cd. contains 64 cu. ft.
> 5 ft. 4 in. = $5\frac{1}{3}$ ft.; $5\frac{1}{3} \times 3$ sq. ft. = 16 sq. ft., area of bottom.
> $64 \div 16 = 4$. The box must be filled 4 ft. deep.

7. At what depth must this box be marked to contain 1 cd. ft.? for 2 cd. ft.? for 3 cd. ft.?

8. Mr. Jones carts 8 even loads in No. 9. How many cords has he delivered?

WEIGHING PROBLEMS

GROSS, TARE, AND NET

The terms **gross, tare,** and **net** are business expressions used when the materials sold are delivered in wagons, casks, firkins, etc.

Gross weight is the weight of material and its container.

Tare is the weight of the container (wagon, cask, firkin, etc.).

Net weight is the weight of the material itself and is obtained by subtracting the tare from the gross weight.

Oral Exercise

Compute the net weight of powder put up in tin cans or glass jars as follows:

	Gross Weight	Tare	Net Weight
1.	16 oz.	2 oz.	?
2.	16 oz.	$1\frac{1}{2}$ oz.	?
3.	8 oz.	$1\frac{1}{2}$ oz.	?
4.	12 oz.	2 oz.	?
5.	16 oz.	$\frac{1}{2}$ oz.	?
6.	15 oz.	3 oz.	?
7.	20 oz.	4 oz.	?
8.	16 oz.	$2\frac{1}{2}$ oz.	?
9.	18 oz.	2 oz.	?
10.	10 oz.	$1\frac{1}{2}$ oz.	?

Written Exercise

Compute the net weight of coal delivered in wagons and auto trucks as follows:

	Gross Weight	Tare	Net Weight
1.	3375 lb.	1480 lb.	?
2.	3194 lb.	1210 lb.	?
3.	4065 lb.	2120 lb.	?
4.	3720 lb.	1680 lb.	?
5.	3005 lb.	1010 lb.	?
6.	3615 lb.	1430 lb.	?
7.	3196 lb.	1290 lb.	?
8.	3984 lb.	2050 lb.	?
9.	3915 lb.	1860 lb.	?
10.	3285 lb.	1450 lb.	?

THE PUBLIC WEIGHER

RECORD OF WEIGHT

	BROCKTON, MASS., MAY 4, 1916
Load of Hay	
From A. E. Stone	
To E. S. Brown	
	Gross wt. 3020 lb.
	Tare 1140 lb.
	Net —— lb.
	Wm. H. White **Weigher**

In order to protect the public, all scales for weighing things for which the public have to pay are required to be tested by a Sealer of Weights and Measures. Men who are licensed to weigh coal, hay, and other expensive necessaries of life, which come by the ton, etc., are placed under oath and called sworn weighers. They are usually required to keep an accurate record of all weighing done, in a book containing blank forms like the above.

1. A. E. Stone with a load of hay for E. S. Brown weighs in as he goes to deliver it. His wagon is on record at the weigher's office as weighing 1140 lb. and the above record is made. How much hay does he deliver? The above record is kept on file at the office of the legal weigher.

2. Mr. Andrew's hay wagon weighs 1025 lb. He carts 5 loads to S. R. Thompson. Their gross weights are: 2290 lb., 2675 lb., 2806 lb., 2485 lb., 2560 lb. What is the net weight of each? How much hay does he deliver in all?

3. A. B. Stone's hay wagon weighs 870 lb. He delivers 4 loads whose gross weights are 2365 lb., 2140 lb., 2280 lb., 2090 lb. What is the net weight of each? the total net weight?

4. The Central Ice Company sent loads to the cooler in A. B. Jones & Company's market in a cart weighing 2600 lb. Three loads were sent in a week, their gross weights being 4205 lb., 3875 lb., 3905 lb. How much ice was delivered? How much did it cost at 50 ¢ per hundredweight?

5. A wagon weighing 973 lb. was loaded with bales of hay weighing as follows: 125 lb., 150 lb., 130 lb., 205 lb., 196 lb., 227 lb., 186 lb., 195 lb., 206 lb., 157 lb. What was the whole or gross weight? When driven on the platform scales the whole load including the driver weighed 2876 lb. What was the driver's weight?

6. The next wagon on the scales was filled with shelled corn. The wagon weighed 1205 lb. and the whole load 2409 lb. How much corn was there? If one bushel weighs 56 lb., how many bushels were there in the load?

Changing from Pounds to Short Tons

2000 Lb. = 1 Short Ton (T.)

1. How many tons are equal to 15,620 lb.?

15.620. (Moving point three places divides by 1000.)
7.81. (Dividing by 2 completes the division by 2000 and gives the number of tons.)

2. 5180 lb. = how many tons?
3. 8640 lb. = how many tons?
4. 21,860 lb. = how many tons?
5. 370 lb. = what part of a ton?
6. 1420 lb. = what part of a ton?
7. 1880 lb. = what part of a ton?
8. 3210 lb. = how many tons?
9. 13,050 lb. = how many tons?
10. 4910 lb. = how many tons?

11. What is the cost of 750 lb. at \$8 per ton?

$$750 \text{ lb.} = \frac{750}{2000} \text{ T.}; \ \frac{\overset{3}{\cancel{750}}}{\underset{8}{\cancel{2000}}} \text{ of } \$\cancel{8} = \$3.$$

Or

As in problems 1–10, move the point 3 places to the left and divide by 2.

(*a*) 750 lb.	(*b*) \$8.~~00~~, price of 1 T.
.750 M.	.375
.375 T.	\$3.00, cost of 750 lb.

12. Using either of the above methods, compute the cost of the following odd loads at prices given per ton:

(*a*) 1430 lb. at \$7.50.
(*b*) 1280 lb. at \$6.50.
(*c*) 970 lb. at \$8.00.
(*d*) 1850 lb. at \$6.75.
(*e*) 1690 lb. at \$6.00.
(*f*) 1940 lb. at \$7.00.
(*g*) 1360 lb. at \$7.50.
(*h*) 1180 lb. at \$8.25.
(*i*) 790 lb. at \$6.75.
(*j*) 1420 lb. at \$9.00.

13. Compute the net weight of ice delivered in wagons:

	Gross Weight	Tare	Net Weight
(*a*)	5072 lb.	2165 lb.	?
(*b*)	4687 lb.	1780 lb.	?
(*c*)	4725 lb.	2330 lb.	?
(*d*)	3967 lb.	1890 lb.	?
(*e*)	4186 lb.	1290 lb.	?

	Gross Weight	Tare	Net Weight
(*f*)	5610 lb.	2218 lb.	?
(*g*)	4890 lb.	1940 lb.	?
(*h*)	3964 lb.	2160 lb.	?
(*i*)	5185 lb.	1790 lb.	?
(*j*)	4975 lb.	1830 lb.	?

14. Compute the cost of each of the above loads at \$5.50 per ton.

THE COAL BUSINESS

STANDARD SCALES

DRIVING ON TO THE WEIGHING PLATFORM

In the retail coal business, before each driver starts to deliver his load, he drives it upon the platform of the scales, and the clerk in the office notifies him whether his load is too small or too large and how many pounds he must add or take off. A driver soon learns how much the average shovelful weighs and can estimate his load by counting the shovelfuls.

1. Driver No. 1 has a wagon weighing 2150 lb. If he carries a ton (2000 lb.) of coal, how much should the whole weigh? If it weighs 4167 lb., how much coal should he take off? how much if it weighs 4172 lb.?

2. Driver No. 2 has a 1220-pound wagon. What should be the gross weight with an even ton? If the gross weight is only 3213 lb., how much coal should be added? how much if it is 3205 lb.?

3. Driver No. 3 has a 980-pound wagon. The gross weight of his load is 2996 lb. Should he add or take off coal and how much to carry an even ton?

4. Driver No. 4 has a 1056-pound cart. The gross weight of his load is 3112 lb. Should he add or take off coal and how much to carry an even ton?

5. If No. 4 had weighed in at 2468 lb., what would the net weight (coal alone) have been?

6. If No. 3 had weighed in at 2749 lb., what would the net weight of his load have been?

7. Mr. Esterbrook, whose wagon weighs 1150 lb., takes on a load sufficient to bring the gross weight up to 2650 lb. How much coal is there in his load? How much is it worth at $7.50 a ton?

8. Mr. Hartman, using a wagon weighing 1180 lb., carts loads of coal of the following gross weights: 3130 lb., 3055 lb., 3020 lb., 3090 lb., and 2605 lb.

(*a*) Compute the net weight of each load and add the five net weights.

(*b*) Check this result by adding the five gross weights and subtracting five times the weight of the wagon.

(*c*) If Mr. Hartman pays for this coal at the rate of $7.40 a ton, how much does it cost him?

9. A farmer living two miles from the railroad had two of his men haul the winter's supply of furnace coal. The first man used a wagon weighing 1550 lb. and the gross weight of each of his five loads was as follows: 3420 lb., 3340 lb., 3490 lb., 3450 lb., 3050 lb. How much coal was there in each load?

10. The gross weight of each load as carted by the second teamster, using a cart weighing 1170 lb., was as follows: 3010 lb., 2840 lb., 2760 lb., 2790 lb., 2450 lb. How much coal did he cart in all?

TABLES FOR COMPUTING COAL CHARGES

To save time and to prevent mistakes, tables are devised which enable the clerk to ascertain quickly the correct charge for fractional parts of a ton. Compute all charges in the following problems by using the table on the opposite page.

1. A farmer, whose cart weighed 870 lb., took on a load which brought it up to 2290 lb. How much coal had he [illegible]? How much was it worth at $6.25 per ton?

The difference between 2290 lb. and 870 lb. is 1420 lb. Read along the 1400-pound line as far as the $6.25 column, where you will find $4.38, which is the cost of 1400 lb. Then read along the 20-pound line to the same column, and you will find $.06. $4.38 + $.06 = $4.44, the cost of 1420 lb.

2. Use the table and compute the cost of the following net weights at the prices mentioned per ton:

(*a*)	850 lb. at $6.50.	(*f*)	930 lb. at $6.25.
(*b*)	1640 lb. at 6.00.	(*g*)	1390 lb. at 7.50.
(*c*)	550 lb. at 7.50.	(*h*)	1060 lb. at 7.25.
(*d*)	1220 lb. at 6.75.	(*i*)	1610 lb. at 6.75.
(*e*)	1570 lb. at 8.00.	(*j*)	590 lb. at 7.75.

3. Mr. Whitman's cart weighed 1243 lb. After the load had been added it weighed 3123 lb. How much did he pay for the coal sold for $7.25 per ton?

4. Mr. Hastings had a cart weighing 980 lb. He took on a load which brought it up to 2660 lb. How much was it worth at $7.50 per ton?

5. Mr. Jones had a cart weighing 1174 lb. He carried three loads whose gross weight was 2684 lb., 2874 lb., 2864 lb. How much should he pay for the lot at $6.75 per ton?

6. Fill in the $8.25 column in the table to the nearest cent.

Retail Coal Table

(To aid in computing the price of fractional parts of a ton)

PRICES (IN DOLLARS) PER TON (2000 lb.)									
6.00	**6.25**	**6.50**	**6.75**	**7.00**	**7.25**	**7.50**	**7.75**	**8.00**	**8.25**
.03	.03	.03	.03	.04	.04	.04	.04	.04	?
.06	.06	.07	.07	.07	.07	.08	.08	.08	?
.09	.09	.10	.10	.11	.11	.11	.12	.12	?
.12	.13	.13	.14	.14	.15	.15	.16	.16	?
.15	.16	.16	.17	.18	.18	.19	.19	.20	?
.18	.19	.20	.20	.21	.22	.23	.23	.24	?
.21	.22	.23	.24	.25	.25	.26	.27	.28	?
.24	.25	.26	.27	.28	.29	.30	.31	.32	?
.27	.28	.29	.30	.32	.33	.34	.35	.36	?
.30	.31	.33	.34	.35	.36	.38	.39	.40	?
.60	.63	.65	.68	.70	.73	.75	.78	.80	?
.90	.94	.98	1.01	1.05	1.09	1.13	1.16	1.20	?
1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	?
1.50	1.56	1.63	1.69	1.75	1.81	1.88	1.94	2.00	?
1.80	1.88	1.95	2.03	2.10	2.18	2.25	2.33	2.40	?
2.10	2.19	2.28	2.36	2.45	2.54	2.63	2.71	2.80	?
2.40	2.50	2.60	2.70	2.80	2.90	3.00	3.10	3.20	?
2.70	2.81	2.93	3.04	3.15	3.26	3.38	3.49	3.60	?
3.00	3.13	3.25	3.38	3.50	3.63	3.75	3.88	4.00	?
3.30	3.44	3.58	3.71	3.85	3.99	4.13	4.27	4.40	?
3.60	3.75	3.90	4.05	4.20	4.35	4.50	4.65	4.80	?
3.90	4.06	4.23	4.39	4.55	4.71	4.88	5.04	5.20	?
4.20	4.38	4.55	4.73	4.90	5.08	5.25	5.43	5.60	?
4.50	4.69	4.88	5.06	5.25	5.44	5.63	5.81	6.00	?
4.80	5.00	5.20	5.40	5.60	5.80	6.00	6.20	6.40	?
5.10	5.31	5.53	5.74	5.95	6.16	6.38	6.59	6.80	?
5.40	5.63	5.85	6.08	6.30	6.53	6.75	6.98	7.20	?
5.70	5.94	6.18	6.41	6.65	6.89	7.13	7.36	7.60	?
6.00	6.25	6.50	6.75	7.00	7.25	7.50	7.75	8.00	?

COST OF FREIGHT

Coal used in the New England states is brought by sea to the nearest port, thence by rail, if the town is not on the coast; or it may come all the way by rail, which is an expensive method of transportation. The cost of coal for people living at a distance from the coal mines is seriously affected by transportation rates. The coal dealer has his orders sent by sea or rail according to which is cheaper.

2240 lb. = 1 long ton or gross ton (L. T.)

112 lb. ($\frac{1}{20}$ of 1 L. T.) = 1 long hundredweight

The freight on coal sent all the way by rail from Pennsylvania to Waterfield, Mass., is \$3 per long ton. As it would be somewhat difficult in filling cars to get even tons, the cost is billed by some companies to the *nearest* hundredweight.

1. At \$3.15 per ton, find the cost of the freight on a carload of coal weighing 31 L. T. 15 cwt.

Cost of 31 L. T. = 31 × \$3.15 = \$97.65

Cost of 15 cwt. = $\frac{15}{20}$, or $\frac{3}{4}$, of \$3.15 = $\frac{\$9.45}{4}$ = \$2.36

\$97.65 + \$2.36 = \$100.01

Compute the cost of freight on each of the following shipments at \$3 per long ton, considering 1 cwt. as 112 lb.:

2. 25 L. T. 9 cwt.	**5.** 22 L. T. 16 cwt.
3. 23 L. T. 11 cwt.	**6.** 27 L. T. 15 cwt.
4. 24 L. T. 13 cwt.	**7.** 28 L. T. 5 cwt.

8. How much would the freight cost on a carload of 40 L. T. 8 cwt. at \$.85 per long ton?

9. Find the cost of freight on a load of 38 L. T. 6 cwt. at \$.65 per long ton.

10. Find the cost of freight on a load of 28 L. T. 15 cwt. at \$.70 per long ton.

—

11. Find the cost of freight on a load of 32 L. T. 19 cwt. at $.85 per long ton?

12. The following three carloads, 30 L. T. 2 cwt., 28 L. T. 5 cwt., and 39 L. T. 4 cwt., were received at the freight yard. Compute the freight on the total amount received, at $.85 per long ton.

13. It is a business-like precaution to verify the accuracy of all charges by comparing the actual goods received with those billed. A college using large quantities of soft coal for its heating plant buys it by the carload, unloads it, and carts it from the freight yard to the engine rooms. Each trip the teamster drives his load on the scales and makes a record of the gross weight like that at the left. His two-horse wagon weighs 1170 lb. The car he is unloading is billed at 13 L. T. 7 cwt.

TEAMSTER'S RECORD

Gross Weight	Tare	Net Weight
2560	1170	?
2480	1170	?
2730	1170	?
2560	1170	?
3040	1170	?
3210	1170	?
2950	1170	?
3160	1170	?
2890	1170	?
3090	1170	?
3180	1170	?
2980	1170	?
3210	1170	?
3320	1170	?
2990	1170	?
2960	1170	?
2670	1170	?
? *a*	? *b*	? *c*
−? *b*		
? *c**		

* Should agree with *c*

(*a*) Subtract the tare in each line from the gross weight to find the net weight of each load.

(*b*) Add the net weight column and see if it agrees with the amount billed in the carload. If not, your own work may be wrong; so it should be proved or checked. To check your work, add the gross weight column; and from the sum subtract 17 times 1170. The difference should be the same as the sum of the 3d column or the net weight of the carloads.

How much does the record show?

Coal Dealer's Computing Table

Wholesale 2240 lb. = 1 L. T. (long ton)						
lb.	$3.50	$3.75	$4.00	$4.25	$4.50	$5.00
10	.02	.02	.02	.02	.02	.02
20	.03	.03	.04	.04	.04	.04
30	.05	.05	.06	.06	.06	.07
40	.06	.07	.07	.08	.08	.09
50	.08	.08	.09	.09	.10	.11
60	.09	.10	.11	.12	.13	.13
70	.11	.12	.12	.13	.14	.16
80	.13	.13	.14	.15	.16	.18
90	.14	.15	.16	.17	.18	.20
100	.16	.17	.18	.19	.20	.22
200	.31	.33	.36	.38	.40	.45
300	.47	.50	.54	.57	.60	.67
400	.63	.67	.71	.76	.80	.89
500	.78	.84	.89	.95	1.00	1.12
600	.94	1.00	1.07	1.14	1.20	1.34
700	1.09	1.17	1.25	1.33	1.41	1.56
800	1.25	1.34	1.43	1.52	1.61	1.79
900	1.41	1.51	1.61	1.71	1.81	2.01
1000	1.56	1.67	1.79	1.90	2.01	2.23
1100	1.72	1.84	1.96	2.09	2.21	2.46
1200	1.87	2.01	2.14	2.28	2.41	2.68
1300	2.03	2.18	2.32	2.47	2.61	2.90
1400	2.19	2.34	2.50	2.66	2.81	3.12
1500	2.34	2.51	2.68	2.85	3.01	3.35
1600	2.50	2.68	2.86	3.04	3.21	3.57
1700	2.66	2.85	3.03	3.23	3.41	3.79
1800	2.81	3.01	3.21	3.42	3.61	4.02
1900	2.97	3.18	3.39	3.60	3.82	4.24
2000	3.13	3.35	3.57	3.79	4.02	4.46
2100	3.28	3.52	3.75	3.98	4.22	4.69
2200	3.44	3.68	3.93	4.17	4.42	4.91

THE WHOLESALE COAL TRADE

Wholesale coal merchants sell to the retail dealers by the long ton (2240 lb.). To save the time of computing the price on different amounts constantly being shipped, the clerks use a printed table in which the price of any amount from 10 lb. to 2240 lb. can be immediately seen. This table is used chiefly in computing the cost of fractional parts of a long ton shipped to a retail dealer, or carted to customers near by.

1. A carload billed to a retail dealer at $4 per long ton contains 24 L. T. and 350 lb. over.

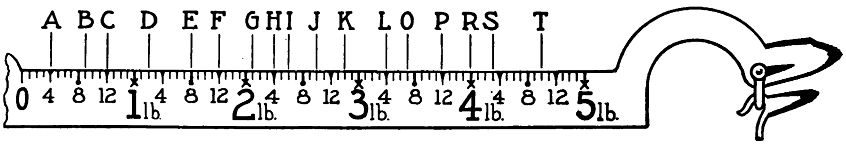
Cost of 24 T. @ $4	= $96.00
Cost of 300 lb. (See Table, page 110, 300 lb. line, $4 column)	= .54
Cost of 50 lb. (See Table, 50 lb. line, $4 column)	= .09
Total cost	= $96.63

Use the table on page 110 and compute the cost of the following fractional parts of a long ton:

		Price per Ton			Price per Ton
2.	850 lb.	$4.25	15.	370 lb.	$4.00
3.	670 lb.	$4.50	16.	490 lb.	$4.50
4.	180 lb.	$4.25	17.	570 lb.	$4.25
5.	480 lb.	$5.00	18.	680 lb.	$4.50
6.	350 lb.	$4.50	19.	750 lb.	$5.00
7.	1570 lb.	$5.00	20.	870 lb.	$4.25
8.	1080 lb.	$4.25	21.	980 lb.	$4.25
9.	290 lb.	$4.25	22.	1150 lb.	$5.00
10.	270 lb.	$5.00	23.	1270 lb.	$4.00
11.	1850 lb.	$3.50	24.	2080 lb.	$5.00
12.	1890 lb.	$3.75	25.	2100 lb.	$4.50
13.	1950 lb.	$4.00	26.	2160 lb.	$3.50
14.	1970 lb.	$4.50	27.	2200 lb.	$4.00

THE HARDWARE BUSINESS

SELLING GOODS BY WEIGHT



Oral Exercise

1. How heavy is the article in the scalepan if the sliding weight is at *A*? Answer the same question for each of the other points lettered.

2. If a weight marked 10 lb. is hung on the hook, as indicated by the arrow, what will be the weight when the slide is at *A*? *B*? etc.

3. Compute the charge on the following articles with the weights as indicated :

Goods Purchased	Weight on Hook	Sliding Weight at	Cost per Pound	Charge
Nails	10 lb.	*A*	\$ .04½	?
Rope	none	*P*	.18	?
Lead pipe	15 lb.	*F*	.07½	?
Sheet lead	15 lb.	*H*	.08½	?
Plaster of Paris	5 lb.	*D*	.02	?
Muresco	10 lb.	*E*	.07	?
Glue	none	*H*	.15	?
Sheet iron	10 lb.	*L*	.08	?
Galvanized iron	10 lb.	*P*	.10	?

SELLING GOODS BY THE SQUARE FOOT

A **running foot** is 1 ft. long without regard to width.

To find the number of square feet:

Multiply the number of running feet by the width expressed as feet.

1. How many square feet of poultry netting are there in 15 running feet of 30″ netting?

30 in. = $2\frac{1}{2}$ ft.; $2\frac{1}{2} \times 15$ sq. ft. = $37\frac{1}{2}$ sq. ft.

2. Find the cost of 25 ft. of 42″ netting at $1\frac{1}{2}$¢ per square foot.

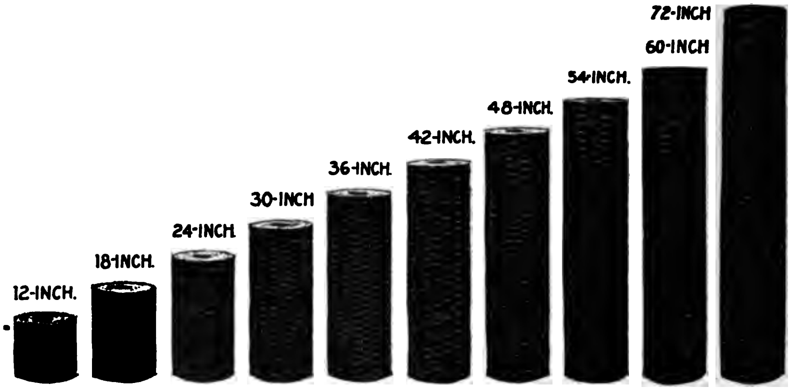
42 in. = $3\frac{1}{2}$ ft. $3\frac{1}{2} \times 25 \times 1\frac{1}{2}¢ = \frac{7}{2} \times 25 \times \frac{3}{2}¢ = \frac{525}{4}¢$ = \$1.31¼ or \$1.31.

Oral Exercise

How many square feet are there in each of the following lengths?

1. 26 ft. of 12″ netting.
2. 30 ft. of 18″ netting.
3. 15 ft. of 36″ netting.
4. 16 ft. of 48″ netting.
5. 20 ft. of 60″ netting.
6. 10 ft. of 72″ netting.
7. 12 ft. of 18″ netting.
8. 25 ft. of 24″ netting.
9. 10 ft. of 30″ netting.
10. 10 ft. of 42″ netting.

SELLING POULTRY WIRE



Find the cost of the following lengths of poultry wire:

	Running Feet	Width and Kind	Price per Sq. Ft.	Number Sq. Ft.	Cost
1.	30 ft.	18″ Hexagonal Chick Net	1½¢	45	$.68
2.	37 ft.	24″ Hexagonal Chick Net	1½¢	—	—
3.	60 ft.	30″ Hexagonal Chick Net	1½¢	—	—
4.	48 ft.	18″ U. S. Chick Net	1½¢	—	—
5.	115 ft.	24″ U. S. Chick Net	1½¢	—	—
6.	70 ft.	30″ U. S. Chick Net	1½¢	—	—
7.	57 ft.	36″ Hexagonal Poultry Net	¾¢	—	—
8.	80 ft.	42″ Hexagonal Poultry Net	¾¢	—	—
9.	60 ft.	48″ Hexagonal Poultry Net	¾¢	—	—
10.	90 ft.	54″ Hexagonal Poultry Net	¾¢	—	—
11.	117 ft.	60″ Hexagonal Poultry Net	¾¢	—	—
12.	81 ft.	36″ U. S. Poultry Net	¾¢	—	—
13.	48 ft.	18″ U. S. Poultry Net	¾¢	—	—
14.	75 ft.	24″ U. S. Poultry Net	¾¢	—	—
15.	40 ft.	42″ U. S. Poultry Net	¾¢	—	—
16.	37 ft.	48″ U. S. Poultry Net	¾¢	—	—
17.	50 ft.	54″ U. S. Poultry Net	¾¢	—	—
18.	52 ft.	60″ U. S. Poultry Net	¾¢	—	—

MOSQUITO NETTING

squito netting comes in rolls whose widths run from 16″ to in even inches, that is, 16″, 18″, 20″, etc. There are three non grades — the black, selling for $.02 a square foot; the anized for $.04 a square foot; and the copper for $.08 a re foot.

. Find the cost of 3 ft. of 22″ black netting.

$$22 \text{ in.} = 1\frac{5}{6} \text{ ft.};\quad 1\frac{5}{6} \times 3 \times 2¢ = \frac{11}{\cancel{6}_{\cancel{2}}} \times \cancel{3} \times \cancel{2}¢ = 11¢.$$

. Find the cost of 40 in. of 28″ black netting.

$$40 \text{ in.} = 3\tfrac{1}{3} \text{ ft.};\quad 28 \text{ in.} = 2\tfrac{1}{3} \text{ ft.}$$
$$3\tfrac{1}{3} \times 2\tfrac{1}{3} \times 2¢ = \tfrac{10}{3} \times \tfrac{7}{3} \times 2¢ = \tfrac{140}{9}¢ = 15\tfrac{5}{9}¢, \text{ or } 16¢.$$

nd the cost at $.02 per square foot of:

. 5 ft. of 38″ netting.

. 8 ft. of 42″ netting.

. 4 ft. of 26″ netting.

. 2½ ft. of 18″ netting.

. 6 ft. of 24″ netting.

8. 40 ft. of 24″ netting.

9. 45 ft. of 30″ netting.

10. 36 ft. of 24″ netting.

11. 70 ft. of 36″ netting.

12. 50 ft. of 18″ netting.

ow much will be charged for the following lengths at $.04 square foot?

. 13 ft. of 12″ netting.

. 20 ft. of 18″ netting.

. 12 ft. of 24″ netting.

. 10 ft. of 30″ netting.

. 20 ft. of 36″ netting.

18. 12 ft. of 42″ netting.

19. 20 ft. of 48″ netting.

20. 10 ft. of 54″ netting.

21. 15 ft. of 60″ netting.

22. 20 ft. of 72″ netting.

Table of Prices of Mosquito Netting

There is so much figuring for many of the orders for mosquito netting that it is usually found advisable to make a table of prices.

1. Fill in the 1 ft. line, 16″ column, of the table below.

16 in. wire is $1\frac{1}{3}$ ft. wide.
$1 \times 1\frac{1}{3} \times 2¢ = 1 \times \frac{4}{3} \times 2¢ = \frac{8}{3}¢ = 2\frac{2}{3}¢$, or 3¢.

2. Fill in the 4 in. line, 16″ column, of the table.

4 in. = $\frac{1}{3}$ ft. long; 16 in. = $1\frac{1}{3}$ ft. wide.
$\frac{1}{3} \times 1\frac{1}{3} \times 2¢ = \frac{1}{3} \times \frac{4}{3} \times 2¢ = \frac{8}{9}¢$, or 1¢.

3. Rule a table like the following and fill in all blank spaces:

Selling Price of Mosquito Netting at 2¢ per Square Foot

Lengths in Feet	16″ wide	18″ wide	20″ wide	22″ wide	24″ wide	26″ wide	28″ wide	30″ wide	32″ wide	34″ wide
1 ft.	3¢									
2 ft.										
3 ft.										
4 ft.						17¢		20¢		
5 ft.										
6 ft.										
7 ft.										
8 ft.										
9 ft.										
10 ft.										
Parts of a Foot										
2 in.	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
4 in.	1¢	1¢								
6 in.										
8 in.										
10 in.										

Computing Charges from the Table

1. Find the cost of 50 running inches of 30″ netting.

50 in. = 4 ft. 2 in.	
Read along 4 ft. line to 30 in. column	20¢.
Read along 2 in. line to 30 in. column	1¢.
Total	21¢.

Find the cost of:

2. 5 ft. 4 in. of 18″ net at 2¢ per square foot.
3. 2 ft. 6 in. of 20″ net at 2¢ per square foot.
4. 1 ft. 2 in. of 22″ net at 2¢ per square foot.
5. 4 ft. 8 in. of 24″ net at 2¢ per square foot.
6. 3 ft. 10 in. of 26″ net at 2¢ per square foot.
7. 6 ft. 4 in. of 28″ net at 2¢ per square foot.
8. 10 ft. 2 in. of 30″ net at 2¢ per square foot.
9. 4 ft. 10 in. of 18″ net at 2¢ per square foot.
10. 7 ft. 4 in. of 20″ net 2¢ per square foot.
11. 8 ft. 2 in. of 26″ net at 2¢ per square foot.
12. 3 ft. 10 in. of 24″ net at 2¢ per square foot.
13. 9 ft. 8 in. of 20″ net at 2¢ per square foot.

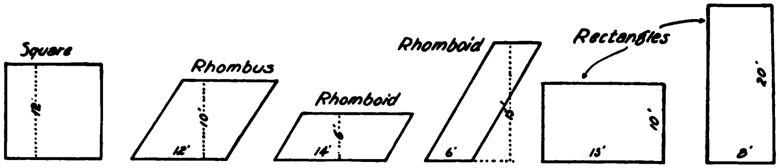
To use the table in computing the price of 4¢, 6¢, or 8¢ wire, merely find the price for 2¢ and multiply by 2, 3, or 4 as needed.

Find the cost of:

14. 30 running inches of 18″ net at 4¢ per square foot.
15. 40 running inches of 20″ net at 4¢ per square foot.
16. 42 running inches of 22″ net at 4¢ per square foot.
17. 54 running inches of 24″ net at 8¢ per square foot.
18. 48 running inches of 20″ net at 8¢ per square foot.
19. 50 running inches of 26″ net at 8¢ per square foot.
20. 60 running inches of 28″ net at 8¢ per square foot.

AREAS OF COMMON FIGURES

PARALLELOGRAMS AND TRIANGLES



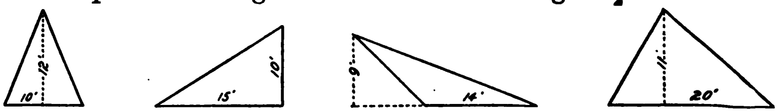
To find the area of a parallelogram:

Find the product of the base by the altitude.*

FORMULA. — **Area = B × A (Base × Altitude).**

Compute mentally the area of each of these parallelograms:

1. Rectangle $12'' \times 5\frac{1}{2}''$.
2. Rhomboid $13'' \times 4''$.
3. Square $12''$ long.
4. Rhomboid $50' \times 30'$.
5. Rhombus $200' \times 5'$.
6. Rectangle $8\frac{1}{2}' \times 8'$.



To find the area of a triangle:

Find one half the product of the base by the altitude.

FORMULA. — **Area** $= \dfrac{\mathbf{B \times A}}{\mathbf{2}}$.

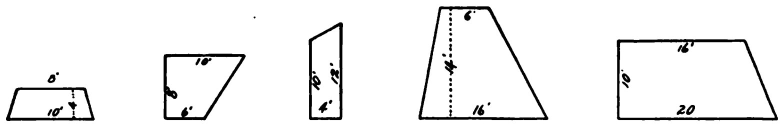
1. Compute mentally the areas of the above triangles.

Compute the area of the following triangles:

2. Base, $35'$; altitude, $16'$.
3. Base, $15\frac{1}{2}'$; altitude, $14'$.
4. Base, $13'$; altitude, $31'$.
5. Base, $43'$; altitude, $17'$.
6. Base, $32'$; altitude, $5\frac{1}{4}'$.
7. Base, $42'$; altitude, $18\frac{1}{6}'$.

* By the product of *lines*, such as base and altitude, is meant the product of the *numbers* that measure them when expressed in *like units*. The area of a rectangle 2 ft. long and 6 in. (or $\frac{1}{2}$ ft.) wide is $(2 \times \frac{1}{2})$ square feet, or 1 sq. ft.

TRAPEZOIDS



A **trapezoid** is a quadrilateral having *only two sides parallel.*

To find the area of a trapezoid:

Add the two parallel sides (long base and short base) and multiply the sum by one half the altitude.

FORMULA. — **Area** $= \frac{\mathbf{A}}{\mathbf{2}} \times$ **(Long Base + Short Base).**

1. Find the area of the trapezoid represented in the first figure above.

$\frac{4}{2} \times (10 + 8) = 36.$ *Ans.* 36 sq. ft.

Compute the area of each of the following trapezoids:

2. Long base, 27″; short base, 20″; altitude, 15″.

3. Long base, 31″; short base, 14″; altitude, 18″.

4. Long base, 17″; short base, 14″; altitude, 9″.

5. Long base, $5\frac{1}{2}$″; short base, $3\frac{1}{2}$″; altitude, 7″.

6. Long base, 106″; short base, 97″; altitude, 53″.

7. How many square feet are there in a trapezoid whose parallel sides are 40 in. and 30 in. long and whose altitude is 18 in.?

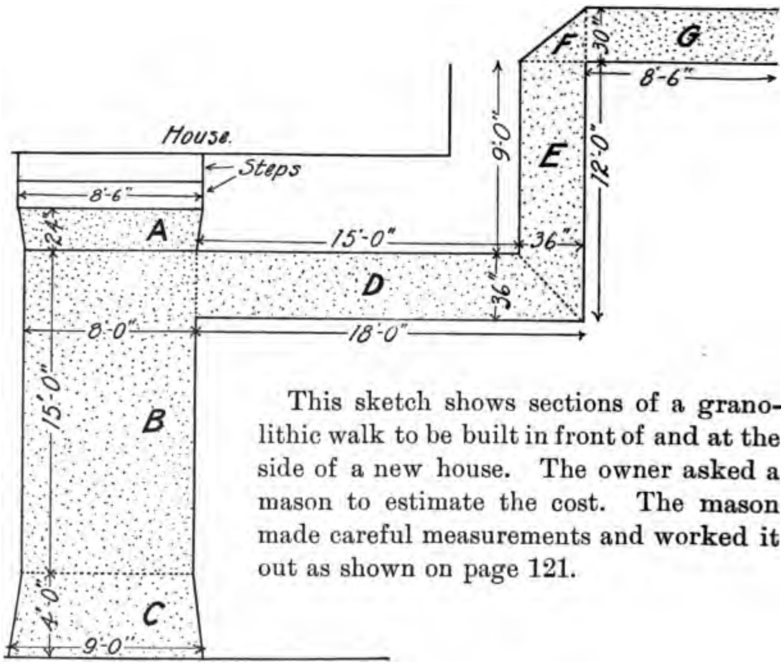
8. How many square yards are there in a trapezoid of the following dimensions: long base, 4 ft.; short base, $3\frac{1}{4}$ ft.; altitude, $2\frac{3}{4}$ ft.?

9. How many square feet are there in a trapezoid whose parallel sides are 20 in. and 25 in. and whose altitude is 15 in.?

A GRANOLITHIC WALK

It is often necessary to find the area of an irregular figure like that below. The usual plan is to divide it, as naturally as possible, into rectangles, triangles, and trapezoids. Study the dotted lines and see how this is accomplished.

The area of each figure is found separately, and the sum of the areas thus obtained is the total area of the more complex figure.



This sketch shows sections of a granolithic walk to be built in front of and at the side of a new house. The owner asked a mason to estimate the cost. The mason made careful measurements and worked it out as shown on page 121.

In mechanical drawings, it is customary to add 0″ when a dimension is a whole number of feet. 8 ft. and 6 in. is expressed 8′–6″; while 8 ft. is expressed 8′–0″.

ESTIMATING AREAS

1. The mason computed the area of the *whole* walk by dealing with one section at a time as follows:

Area of A = —— sq. ft.
Area of B = —— sq. ft.
Area of C = —— sq. ft.
Area of D = —— sq. ft.
Area of E = —— sq. ft.
Area of F = —— sq. ft.
Area of G = —— sq. ft.
Total area = —— sq. ft., or —— sq. yd.

2. Compute the cost of the walk at 20¢ per square foot.

3. Check your work by computing the cost of the walk at $1.80 per square yard. The two costs should agree.

4. After the work was done, the mason presented the following bill, which you may complete:

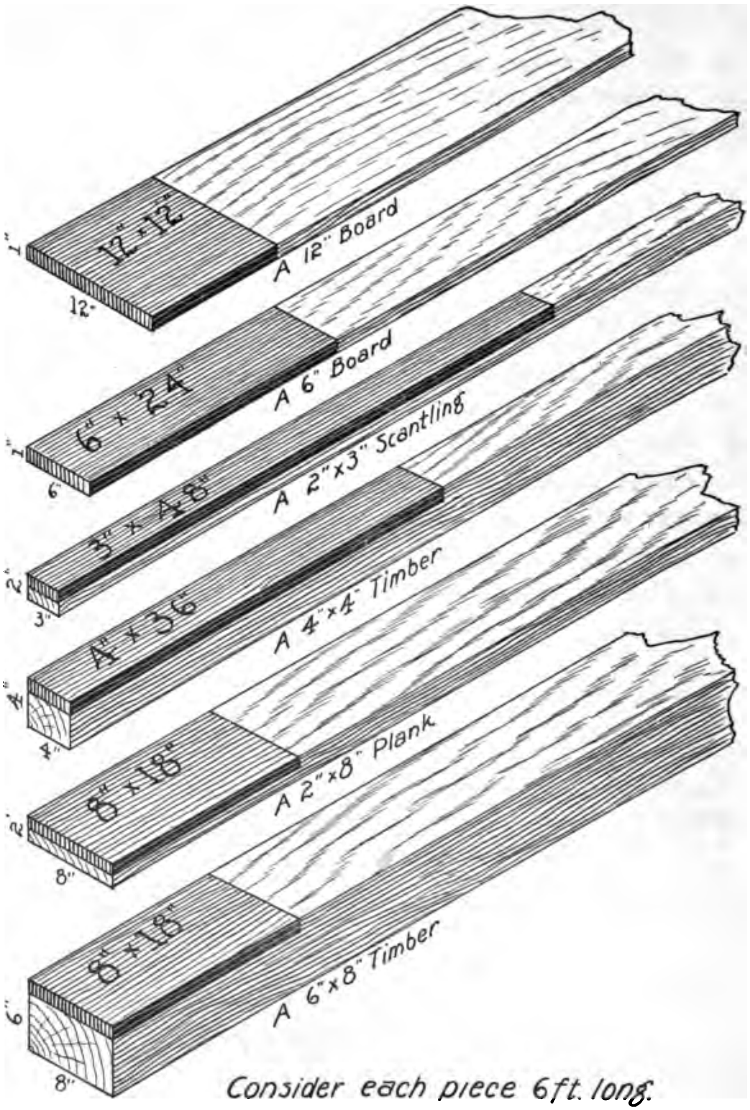
FRANKLIN, IND., Oct. 1, 1915.

MR. *Samuel P. Moore*

TO HAMLIN H. HOWARD, MASON, DR.

20 loads	Sand and gravel	.85	— —	— —
38 sacks	Portland cement	.52	— —	— —
30 hr.	Services of helper	.25	— —	— —
25 hr.	Services of mason	.50	— —	— —
	Received payment, Nov. 1, 1915. HAMLIN H. HOWARD.			

5. How much difference is there between the estimated cost and the real cost?



Consider each piece 6 ft. long.

A PRACTICAL STUDY OF LUMBER

Learn the name of each kind of lumber on the preceding page. The kind is usually indicated by stating **first the thickness and then the width.** The lengths vary greatly.

It is called "Two by three, six by eight," etc.
It is written $2'' \times 3''$, $6'' \times 8''$, etc.

THE BOARD FOOT

A board foot is a square foot one inch or less in thickness.

A square foot contains 144 sq. in. Any area containing that amount, as 4×36 sq. in. or 6×24 sq. in., is considered as a square foot and is paid for accordingly.

To find the number of board feet in any piece of lumber :

Multiply the number of square feet on one side by the number of inches in the thickness.

1. How many board feet are there in a 10-foot piece of $2'' \times 3''$ lumber?

3 in. $= \frac{1}{4}$ ft.; $\frac{1}{4}$ of $10 = \frac{10}{4}$, or $2\frac{1}{2}$, number of square feet.
2 in. = thickness; $2 \times 2\frac{1}{2} = 5$, number of board feet.

Or, $\frac{1}{\cancel{4}_{2}}$ of $\overset{5}{\cancel{10}} \times \cancel{2} = 5$, number of board feet.

2. How many board feet are there in a 12-foot piece of $4'' \times 4''$ lumber?

4 in. $= \frac{1}{3}$ ft.; $\frac{1}{3}$ of $12 = 4$; $4 \times 4 = 16$, number of board feet.

Or, $\frac{1}{\cancel{3}}$ of $\overset{4}{\cancel{12}} \times 4 = 16$, number of board feet.

3. How many board feet are there in a 15-foot piece of $6'' \times 8''$ lumber?

8 in. $= \frac{2}{3}$ ft.; $\frac{2}{3}$ of $15 = 10$; $6 \times 10 = 60$, number of board feet.

Or, $\frac{2}{\cancel{3}}$ of $15 \times \overset{2}{\cancel{6}} = 60$, number of board feet.

Oral Exercise

Find the number of board feet in each piece of lumber in the following list:

1. A 10-foot piece of 12-inch board, 1 in. thick.
2. A 12-foot piece of 6-inch board, 1 in. thick.
3. A 14-foot piece of 6-inch board, 1 in. thick.
4. A 15-foot piece of 4-inch board, 1 in. thick.
5. A 16-foot piece of $2'' \times 3''$ lumber.
6. An 18-foot piece of $2'' \times 6''$ lumber.
7. A 15-foot piece of $2'' \times 8''$ lumber.
8. An 18-foot piece of $3'' \times 4''$ lumber.
9. A 12-foot piece of $4'' \times 4''$ lumber.
10. A 16-foot piece of $4'' \times 6''$ lumber.
11. A 20-foot piece of $6'' \times 6''$ lumber.
12. An 18-foot piece of $6'' \times 8''$ lumber.
13. How many board feet are there in 12-inch boards 1 in. thick of the following lengths? 8 ft., 10 ft., 12 ft., 14 ft.
14. How many board feet are there in 6-inch boards 1 in. thick of the following lengths? 10 ft., 12 ft., 14 ft., 16 ft.
15. How many board feet are there in 4-inch boards 1 in. thick of the following lengths? 9 ft., 12 ft., 14 ft., 16 ft.
16. How many board feet are there in 3-inch boards 1 in. thick of the following lengths? 8 ft., 12 ft., 16 ft., 14 ft.
17. How many board feet are there in $2'' \times 3''$ pieces of the following lengths? 8 ft., 10 ft., 12 ft., 14 ft., 18 ft.
18. How many board feet are there in $2'' \times 4''$ pieces of the following lengths? 9 ft., 12 ft., 15 ft., 18 ft.
19. How many board feet are there in $3'' \times 3''$ pieces of the following lengths? 8 ft., 12 ft., 16 ft., 20 ft.

CARPENTERS' METHOD

The lumber dealer or carpenter usually finds the number of board feet in a number of timbers by *one* process, following a simple mechanical method as shown below:

1. How many board feet are there in 15 timbers, $6'' \times 8''$, 16 ft. long?

$$\frac{\cancel{6} \times \overset{4}{\cancel{8}} \times 16 \times 15}{\underset{\cancel{2}}{\cancel{12}}} = 960,$$ number of board feet. *Ans.* 960 ft. B. M. (Board Measure).

This is the product of all the numbers mentioned, divided by 12 because the width, 8 in., is $\frac{8}{12}$ of a foot.

2. Find the number of board feet in 5 pieces (pcs.) of $2'' \times 8''$ lumber, 12 ft. long.

$$\frac{2 \times 8 \times \cancel{12} \times 5}{\cancel{12}} = 80,$$ number of board feet. *Ans.* 80 ft. B. M.

Using the above method, compute the number of board feet in each of the following lots of lumber:

3. 10 pcs. 1″ by 6″ boards, 12 ft. long.
4. 40 pcs. 1″ by 4″ boards, 10 ft. long.
5. 15 pcs. 2″ by 3″ strips, 14 ft. long.
6. 30 pcs. 2″ by 8″ rafters, 16 ft. long.
7. 14 pcs. 3″ by 4″ stock, 12 ft. long.
8. 5 pcs. 4″ by 4″ stock, 15 ft. long.
9. 12 pcs. 6″ by 6″ timbers, 18 ft. long.
10. 8 pcs. 6″ by 8″ girders, 18 ft. long.
11. 7 pcs. 8″ by 12″ timbers, 16 ft. long.
12. 12 pcs. 1″ by 10″ boards, 14 ft. long.
13. 7 pcs. 1″ by 9″ boards, 10 ft. long.
14. 10 pcs. 1″ by 8″ boards, 9 ft. long.

TABLES FOR COMPUTING LUMBER

Those who are billing lumber all day long in an office would waste time by computing the number of board feet in a given piece of timber every time that size was sold. Instead, the numbers of feet in all the different stock sizes are grouped together in the form of a simple table like that below.

1. Find the number of board feet in a piece of lumber 2″ × 3″—16 ft. long.

Look in the **2″ × 3″** column on the **16 ft.** line. **The figure 8 means** 8 board feet, or 8 ft. B. M.

Section of Lumber Table Dealing with Boards and Small Timbers

Length in feet	1″ × 6″ or 2″ × 3″	1″ × 8″ or 2″ × 4″	1″ × 12″ 2″ × 6″ or 3″ × 4″	2″ × 8″ or 4″ × 4″	3″ × 6″
6 ft.	3	4	6	8	9
8 ft.	4	$5\frac{1}{3}$	8	$10\frac{2}{3}$	12
10 ft.	5	$6\frac{2}{3}$	10	$13\frac{1}{3}$	15
12 ft.	6	8	12	16	18
14 ft.	7	$9\frac{1}{3}$	14	$18\frac{2}{3}$	21
16 ft.	8	$10\frac{2}{3}$	16	$21\frac{1}{3}$	24
18 ft.	9	12	18	24	27
20 ft.	10	$13\frac{1}{3}$	20	$26\frac{2}{3}$	30

Oral Exercise

Using the preceding table, give the number of board feet in each of the following:

1. 1″ by 8″ board, 14 ft. long.
2. 1″ by 6″ board, 18 ft. long.
3. 2″ × 3″ scantling, 14 ft. long.
4. 4″ × 4″ timber, 12 ft. long.
5. 3″ × 6″ timber, 20 ft. long.
6. 2″ × 8″ plank, 16 ft. long.
7. 3″ × 6″ timber, 18 ft. long.

Written Exercise

Any load going to a contractor would contain more than one board or timber of the same size. Find from the table the number of board feet in one stick and multiply this number by the number of sticks ordered. This the clerk can do mentally or with a pencil.

Find the number of board feet in each of the following orders, using the table on page 126:

1. 5 boards — 1″ × 6″ — 18 ft. long.
2. 20 boards — 1″ × 6″ — 14 ft. long.
3. 12 boards — 1″ × 12″ — 10 ft. long.
4. 24 boards — 1″ × 8″ — 12 ft. long.
5. 7 plank — 2″ × 6″ — 14 ft. long.
6. 4 timber — 4″ × 4″ — 18 ft. long.
7. 13 plank — 2″ × 8″ — 20 ft. long.

Making a Lumber Table:

8. Rule a sheet of paper like the following and, using the carpenters' method of computing board measure, fill in the blanks in the table given below:

Lumber Table

Length in feet	2″ × 12″ 3″ × 8″ 4″ × 6″	4″ × 8″	6″ × 6″	6″ × 8″
10 ft.	?	?	?	?
12 ft.	?	?	?	?
14 ft.	?	?	?	?
16 ft.	?	?	?	?
18 ft.	?	?	?	?
20 ft.	?	?	?	?
22 ft.	?	?	?	?
24 ft.	?	?	?	?

BUYING LUMBER

The price of all kinds of lumber is quoted as a certain number of dollars per thousand, that is, per thousand board feet.

$ 30 M means $ 30 per thousand board feet.

Oral Exercise

1. How much will 1260 bd. ft. cost at $ 30 M?

   If 1000 ft. cost $ 30, 1 ft. costs $\frac{1}{1000}$ of $ 30, or $ .03.
   1260 ft. cost 1260 × $ .03, or $ 37.80.

2. How much will 80 bd. ft. cost at $ 40 M?

Written Exercise

1. Compute the cost of 2500 bd. ft. at $ 30 M.
2. Compute the cost of 800 bd. ft. at $ 32 M.
3. Compute the cost of 450 bd. ft. at $ 40 M.
4. Compute the cost of 1,060 bd. ft. at $ 42 M.
5. Compute the cost of 160 bd. ft. at $ 35 M.
6. Compute the cost of 96 bd. ft. at $ 36 M.
7. Compute the cost of 870 bd. ft. at $ 31 M.
8. Compute the cost of 1756 bd. ft. at $ 34 M.
9. Compute the cost of 285 bd. ft. at $ 50 M.
10. Compute the cost of 38 bd. ft. at $ 65 M.
11. Compute the cost of 220 bd. ft. at $ 38 M.
12. Compute the cost of 922 bd. ft. at $ 41 M.
13. Compute the cost of 380 bd. ft. at $ 90 M.
14. Compute the cost of 426 bd. ft. at $ 45 M.
15. Compute the cost of 128 bd. ft. at $ 52 M.
16. Compute the cost of 740 bd. ft. at $ 80 M.
17. Compute the cost of 46 bd. ft. at $ 36 M.
18. Compute the cost of 108 bd. ft. at $ 41 M.

BUILDING PROBLEMS

CELLARS AND CELLAR WALLS

A cellar was excavated for a house 28′ × 32′. It had to be dug about 4 ft. longer and wider than the size of the house, in order to allow room to lay the cellar wall.

1. How long and how wide was the space to be excavated?

2. It was dug down on an average of 4 ft. below the level of the lot. How many cubic feet were removed?

3. Excavating is measured by the cubic yard (27 cu. ft.). How many cubic yards were removed in the above cellar?

4. One-horse dump carts will carry on an average 20 cu. ft. How many one-horse loads were needed to remove the earth in the above cellar? (Call any fractional part a complete load.)

5. If two-horse carts were used, carrying on an average 30 cu. ft. to a load, how many loads would be carted?

6. The wall of rough stone is to be pointed up with lime mortar and costs when completed 17¢ per square foot of cellar face wall. This wall is 4 ft. high; the front and back walls are each 26 ft. long (on the inside); the two side walls, 30 ft. each. Compute the number of square feet and the cost.

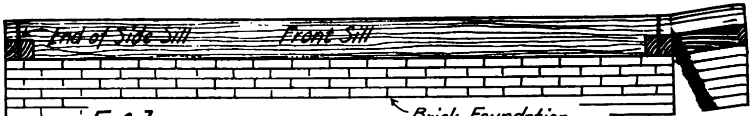


Fig. 1

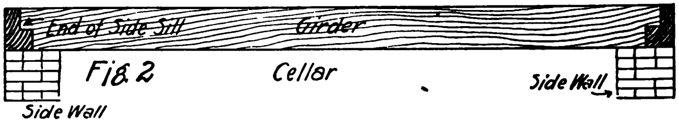


Fig. 2

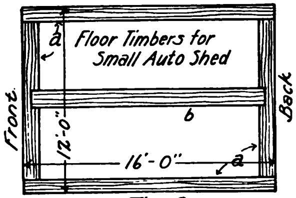
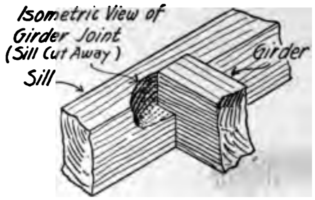


Fig. 3



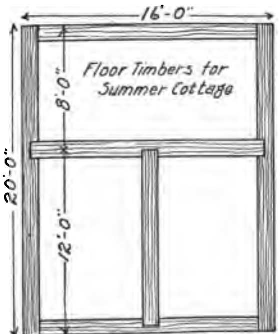


Fig. 4

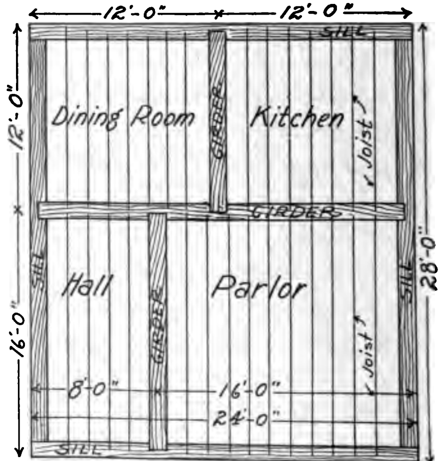


Fig. 5.

BUILDING PROBLEMS

CELLARS AND CELLAR WALLS

A cellar was excavated for a house 28′ × 32′. It had to be g about 4 ft. longer and wider than the size of the house, in er to allow room to lay the cellar wall.

1. How long and how wide was the space to be excavated?

2. It was dug down on an average of 4 ft. below the level the lot. How many cubic feet were removed?

3. Excavating is measured by the cubic yard (27 cu. ft.). w many cubic yards were removed in the above cellar?

4. One-horse dump carts will carry on an average 20 cu. ft. w many one-horse loads were needed to remove the earth in above cellar? (Call any fractional part a complete load.)

5. If two-horse carts were used, carrying on an average 30 ft. to a load, how many loads would be carted?

6. The wall of rough stone is to be pointed up with e mortar and costs when completed 17¢ per square foot of lar face wall. This wall is 4 ft. high; the front and back ls are each 26 ft. long (on the inside); the two side walls, 30 each. Compute the number of square feet and the cost.

Girders and Floor Joists. — Examine Fig. 5, page 132, carefully. Point out the sills and the girders. The chief use of the girders is to sustain the interior weight of the building. They are not supported by a foundation, as the sills are. What supports are used? (Look in your own cellars.) Where are they placed? Girders are usually placed on *edge* to secure greater strength. (To find the reason, try to bend your ruler flatwise and then edgewise.)

The other timbers are floor joists, usually made of spruce and set 16 in. apart from center to center. When these have been set, the first flooring of boards is nailed on to give a surface to stand on before the side walls of the building are raised.

8. How long are the two side sills? the two end sills? the main girder? the back and front girders?

9. Fill in the figures needed in the following table:

2 sills,	6″ × 8″ and 28 ft. long contain	—— bd. ft.
2 sills,	6″ × 8″ and 24 ft. long contain	—— bd. ft.
1 girder,	6″ × 8″ and 24 ft. long contains	—— bd. ft.
1 girder,	6″ × 8″ and 16 ft. long contains	—— bd. ft.
1 girder,	6″ × 8″ and 12 ft. long contains	—— bd. ft.
	Total	—— bd. ft.

10. Count the number of floor joists used under the parlor. They are made of 2″ × 8″ stock. How many board feet are there in all?

11. Compute the number of board feet of floor joists under each of the following rooms, first counting the number of joists shown in the drawing:

Kitchen:	—— joists, 12 ft. long contain	—— bd. ft.
Dining room:	—— joists, 12 ft. long contain	—— bd. ft.
Hall:	—— joists, 16 ft. long contain	—— bd. ft.
	Total	—— bd. ft.

12. Find the cost of floor joists used under the four rooms (Ex. 10 and 11) at $31 per M.

ESTIMATING COST OF LABOR

When a contractor undertakes to build a house, he is called upon to give an estimate of the cost of the entire job. In order to do this, he goes over the plan, estimating the cost of each detail. In estimating the cost of labor, the floor and other parts of the building are divided into squares.

A square is 100 square feet.

1. Find the number of squares in the floor of a building 30 ft. × 28 ft.

$$\frac{30 \times 28}{100} = \frac{840}{100} = 8.4 \text{ squares.*}$$

2. Estimate the cost of labor in framing the floor of a house 26 ft. × 30 ft. at \$1.50 per square, and laying the first floor at \$1.40 per square.

\$1.50 + \$1.40 = \$2.90, cost per square of both framing and flooring.

$\frac{26 \times 30}{100} \times \$2.90 = \$22.62$, total cost of both processes.

Find the number of squares in the floor of each of the following houses:

3. Mr. Bowen's is 32 ft. × 40 ft.

4. Mr. Sampson's is 34 ft. × 42 ft.

5. Mr. Thompson's is 36 ft. × 38 ft.

6. Mr. Gurney's is 37 ft. × 41 ft.

7. Estimate the cost of framing Mr. Bowen's floor at \$1.65 per square, and flooring it at \$1.50 per square.

8. Estimate the cost of framing Mr. Sampson's floor at \$1.80 per square and \$1.70 per square for boarding.

9. Estimate the cost of Mr. Thompson's floor at \$1.80 for framing and \$1.65 for boarding.

* This can also be done by finding the area of the floor in square feet and moving the decimal point two places to the left.

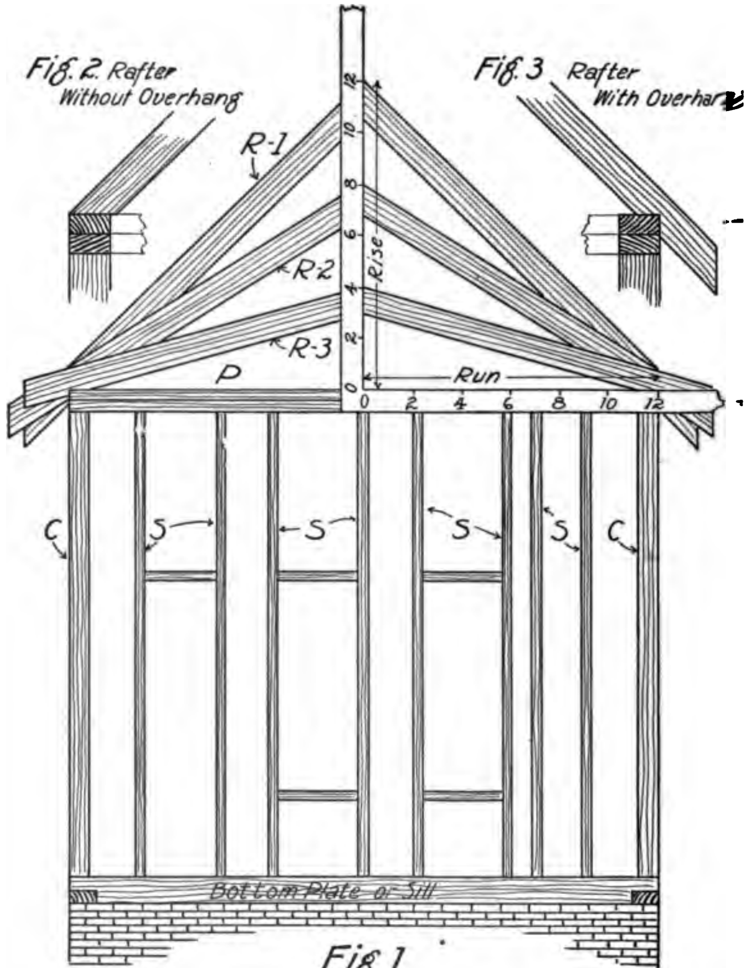


Fig. 1

R - Rafter
P - Top Plate
C - Corner Posts or Corners
S - Studs

5. The cost of *labor in framing* is often reckoned by the 1000 ft. of lumber used. If it takes 670 ft. to frame the sides of the above building, what is the cost of labor at $12.50 per 1000 ft.?

6. How many board feet are needed to sheathe or board in the side nearest you, making no deductions for windows?

NOTE. — When the thickness of boards is not given, they are to be considered as not over 1 in. thick, in which case a board foot is equivalent to a square foot.

7. If each side requires about the same amount, how many feet do the four walls require? Find the cost at $ 35 per M.

8. Carpenters work rapidly at boarding in, and the labor costs about $.85 per square, that is, per 100 square feet. Find the cost of boarding in the four sides.

$$\frac{4 \times 20 \times 10 \times \$.85}{100} = ?$$

9. The timber used in framing the roof is $2'' \times 6''$, and the approximate length of each rafter is given in the picture. The timbers used in framing this quarter of the roof are 10′, 12′, 12′, 16′, 16′, 16′, and 18′. Explain how they could be cut up so as to give all the required rafters.

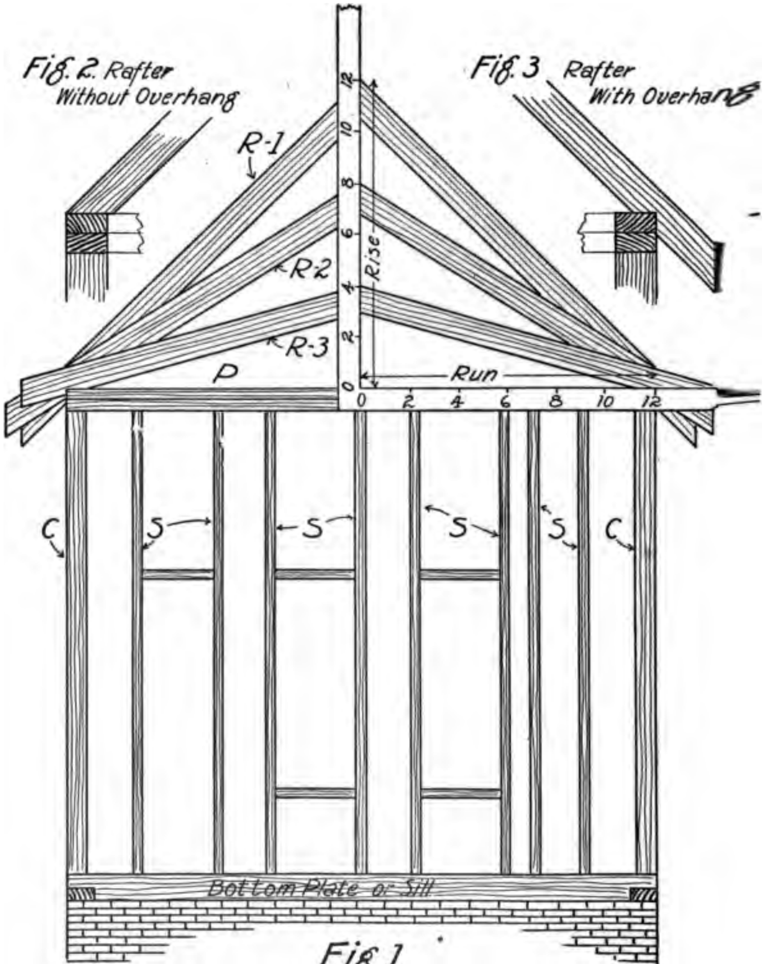


Fig. 1

R - Rafter
P - Top Plate
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S - Studs

Boarding and Shingling Roofs

(See diagrams on page 142.)

1. Compute the area of a *lean-to* roof 12′ × 20′. How many board feet are needed in boarding it in? How much are they worth at $30 per M?

2. Compute the cost of boards in the following lean-to roofs:

(*a*) 8 ft. × 20 ft. at $32 per M.
(*b*) 8 ft. × 32 ft. at $28 per M.
(*c*) 10 ft. × 17½ ft. at $36 per M.

Gable Roofs. — Remember that there are *two* sides to a gable roof. The dash line is the length of any rafter and is the *width* of one side of the roof. The area of the *entire* roof can be found in the following way:

1. How many square feet are there in a gable roof whose ridge is 30 ft. and whose rafter is 25 ft.?

$$2 \times 30 \times 25 \text{ sq. ft.} = 1500 \text{ sq. ft.}$$

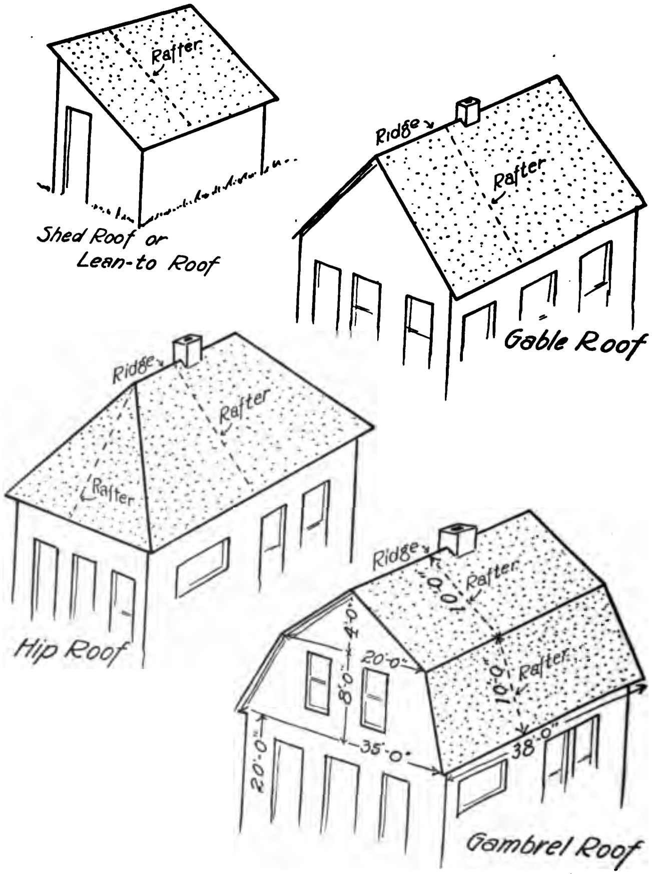
2. How many thousand board feet are needed to board in such a roof?

$$2 \times 30 \times 25 \text{ bd. ft.} = 1500 \text{ bd. ft.} = 1.5 \text{ M bd. ft.}$$

3. Find the cost of boards for both slopes of gable roofs of the following dimensions:

(*a*) Ridge 28 ft., rafter 20 ft., price $31 per M.
(*b*) Ridge 25 ft., rafter 18 ft., price $31 per M.
(*c*) Ridge 30 ft., rafter 24 ft., price $32 per M.

4. If two men can lay 600 ft. of roofing boards in an 8-hour day, how long will it take them to lay each of the roofs in Ex. 3? Count fractional parts of an hour as 1 hour. What will be the cost of labor in each case at $4.50 per day?



TYPES OF ROOFS

Shingling Gable Roofs

Shingles are sold by the thousand. There are four bundles to the thousand. If laid 4 in. to the weather, 4 bundles or 1000 shingles will cover 100 square feet or 1 square.

Note. — In the following examples the shingles are laid 4 in. to the weather.

1. How many thousand shingles are needed for a gable roof whose ridge is 40 ft. and whose rafters are 30 ft. long?

$$\frac{2 \times 3\cancel{0} \times 4\cancel{0}}{1\cancel{0}\cancel{0}} = 24 \text{ squares, requiring 24 M shingles.}$$

2. How much does it cost to cover a gable roof, 32 ft. × 45 ft., with shingles worth \$5 per M?

$$\frac{2 \times \overset{8}{\cancel{32}} \times \overset{9}{\cancel{45}} \times \$\cancel{5}}{\underset{\underset{\cancel{5}}{\cancel{25}}}{\cancel{100}}} = \$144.$$

How much does it cost to shingle each of the following roofs?

3. Rafter 20 ft., ridge 30 ft., price \$3.50 per M.
4. Rafter 25 ft., ridge 32 ft., price \$4.00 per M.
5. Rafter 16 ft., ridge 30 ft., price \$4.50 per M.
6. Rafter 16 ft., ridge 25 ft., price \$3.00 per M.
7. Rafter 20 ft., ridge 35 ft., price \$3.50 per M.
8. Rafter 22 ft., ridge 50 ft., price \$4.25 per M.
9. Rafter 21 ft., ridge 40 ft., price \$3.75 per M.

Hip Roofs

In a hip roof without projecting windows, we have two triangles at front and back, respectively, and two trapezoids on the sides. In a trapezoid the two parallel sides are sometimes referred to as the bases, large (B) and small (b).

Formulas

$$\text{Area of a triangle} = \frac{B \times A}{2}.$$

$$\text{Area of trapezoid} = \tfrac{1}{2}\ \text{Altitude} \times \text{Sum of Parallel Sides};$$

or

$$\frac{A}{2} \times (B + b).$$

1. Compute the area of *one side* (trapezoid) of the following hip roofs:

(*a*) Length at eaves, 30 ft.; ridge, 10 ft.; rafter, 18 ft.
(*b*) Length at eaves, 24 ft.; ridge, 6 ft.; rafter, 16 ft.
(*c*) Length at eaves, 28 ft.; ridge, 8 ft.; rafter, 16 ft.

2. Compute the area of *one end* (triangle) of same roofs from following dimensions:

(*a*) Length at eaves, 26 ft.; length of central rafter, 18 ft.
(*b*) Length at eaves, 20 ft.; length of central rafter, 16 ft.
(*c*) Length at eaves, 24 ft.; length of central rafter, 16 ft.

3. Compute the number of 1000 ft. of lumber needed completely to board in a hip roof, if the longest rafter in each section is 20 ft., the ridge 10 ft., the side eaves 40 ft., and end eaves 30 ft. Draw a diagram and mark all dimensions plainly.

4. Compute the cost at \$35 per M.

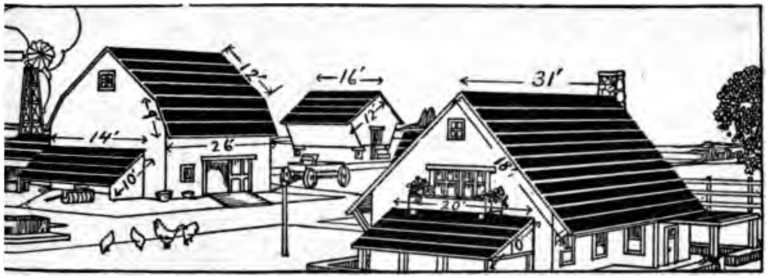
5. Compute the cost of shingling the roof in Ex. 3, estimating 1000 shingles to the square, buying even thousands, and paying \$3.50 per M.

6. Compute the cost of labor for boarding in at \$1.50 per square, and of labor for shingling at \$2.25 per square.

7. Compute the total cost of labor and material for covering the roof, by adding the above amounts.

8. Compute the total area in square feet in a hip roof of the following dimensions: ridge 18 ft., side and longest end rafters 15 ft. each, side eaves 38 ft., and end eaves 22 ft. long.

PREPARED ROOFING FABRICS



1 roll = 108 sq. ft., which covers 1 square, or 100 sq. ft.

In ordering, compute the number of squares in surfaces to be covered and order that number of rolls. Order a whole roll for any fraction of a square remaining.

1. How many rolls are needed to cover two sides of a gable roof 31 ft. long, the rafter being 19 ft. long?

$$\frac{2 \times 19 \times 31}{100} = \frac{1178}{100} = 11.78, \text{ number of squares; 12 rolls are needed.}$$

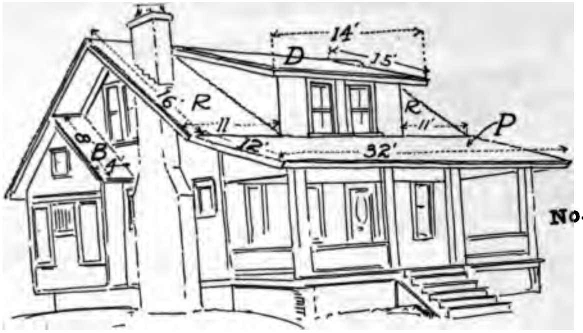
2. Compute the number of rolls needed to cover both sides of the roof of the house shown in the picture.

3. How much will the porch roof require? Find the cost of both roofs at $3.25 per roll.

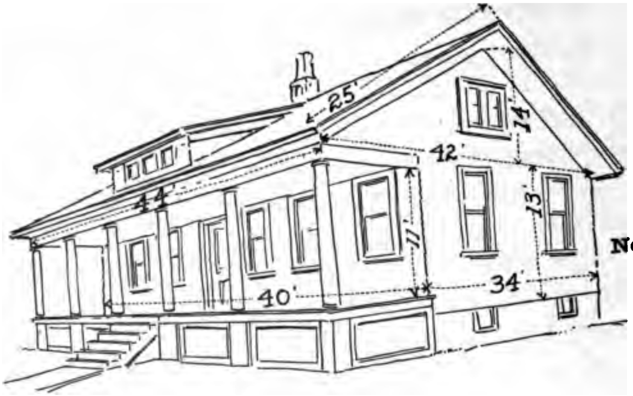
4. The barn has a gambrel roof. Compute the number of squares in the two sides, and add enough for the shed. How many rolls are needed? Find the value at $2.60 per roll.

5. Find the cost of covering both sides of the corn house (in the center of the picture) with a $2.25 quality of roofing.

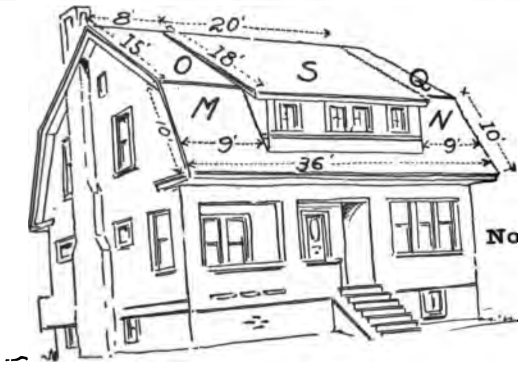
6. Find the cost of shingles, at $4.50 per 1000, for the roofs of the house and porch shown in the picture, counting 1000 shingles to the square and buying even thousands. How much more does this shingling cost than the roofing fabric?



No. [redacted]



NO-



No. 3

Shingling Irregular Roofs

'ind cost of shingling roof of No. 1 at $3.15 per square.

Area of *D* (15′ × 14′)	= —— sq. ft.
Area of *R* (16′ × 11′, without chimney)	= —— sq. ft.
Area of *R* (right)	= —— sq. ft.
Area of *P* (32′ × 12′)	= —— sq. ft.
otal area entire front roof	= —— sq. ft.
Area of back roof (20′ × 32′, without projections)	= —— sq. ft.
Total area of roof	= —— sq. ft.
	or —— squares.
Cost of shingles at $3.15 per square	= ——.

Find cost of shingling 4 sides of No. 2 at $ 4.20 a square.

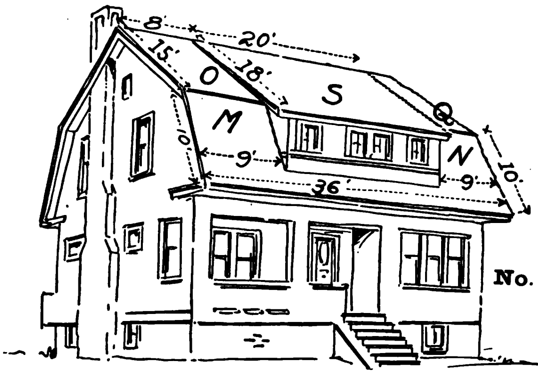
Area of gable end ½ (42′ × 14′)	= —— sq. ft.
Area of side below (13′ × 34′)	= —— sq. ft.
Area of entire opposite end	= —— sq. ft.
Area of front (40′ × 11′, deducting 40 % for openings)	= —— sq. ft.
Area of back (same as front)	= —— sq. ft.
otal area of four sides, etc.	= —— sq. ft.
	or —— squares.
Cost at $4.20 a square for stock	= $ ——.

[ow many shingles are needed for the front roof only of No. 3?

Area of section *O*	= —— sq. ft.
Area of section *Q* (same as *O*)	= —— sq. ft.
Area of section *S*	= —— sq. ft.
Area of section *M* (9′ × 10′)	= —— sq. ft.
Area of section *N* (9′ × 10′)	= —— sq. ft.
Front of projection	= 50 sq. ft.
Total area to be shingled	—— sq. ft.
Number of thousand shingles	= ——.

No. [redacted]

No.



No. 3

Shingling Irregular Roofs

'ind cost of shingling roof of No. 1 at $3.15 per square.

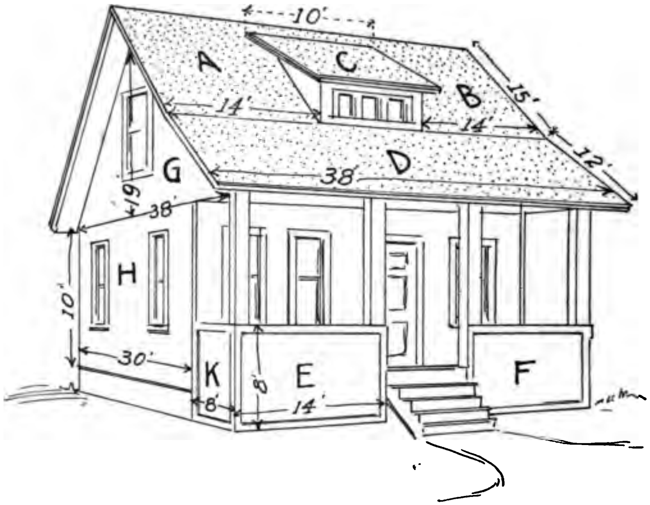
Area of *D* (15′ × 14′)	= —— sq. ft.
Area of *R* (16′ × 11′, without chimney)	= —— sq. ft.
Area of *R* (right)	= —— sq. ft.
Area of *P* (32′ × 12′)	= —— sq. ft.
›tal area entire front roof	= —— sq. ft.
Area of back roof (20′ × 32′, without projections)	= —— sq. ft.
Total area of roof	= —— sq. ft.
	or —— squares.
Cost of shingles at $3.15 per square	= ——.

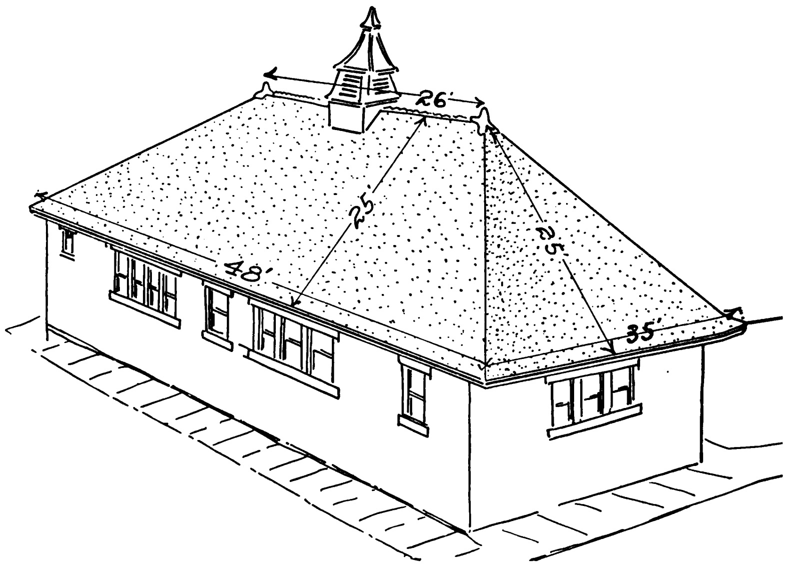
Find cost of shingling 4 sides of No. 2 at $4.20 a square.

Area of gable end ½ (42′ × 14′)	= —— sq. ft.
Area of side below (13′ × 34′)	= —— sq. ft.
Area of entire opposite end	= —— sq. ft.
Area of front (40′ × 11′, deducting 40 % for openings)	= —— sq. ft.
Area of back (same as front)	= —— sq. ft.
›tal area of four sides, etc.	= —— sq. ft.
	or —— squares.
Cost at $4.20 a square for stock	= $ ——.

.ow many shingles are needed for the front roof only of No. 3?

Area of section *O*	= —— sq. ft.
Area of section *Q* (same as *O*)	= —— sq. ft.
Area of section *S*	= —— sq. ft.
Area of section *M* (9′ × 10′)	= —— sq. ft.
Area of section *N* (9′ × 10′)	= —— sq. ft.
Front of projection	= 50 sq. ft.
Total area to be shingled	—— sq. ft.
Number of thousand shingles	= ——.


10'
A
C
B
15'
14'
14'
G
D
38'
12'
19
38'
H
10'
30'
K
E
F
8'
8
14'


26'
25'
25'
48'
35'

SHINGLING AND PAINTING

1. The cottage shown in the first picture on page 148 needs shingling. The cost with a certain make of metal shingles ll be 25 ¢ per square foot. Think of the roof as divided to rectangular sections and compute the probable cost. Slight viations from exact rectangular outlines need not be counted.

(*a*) Area of section *A* = —— sq. ft.
(*b*) Area of section *B* = —— sq. ft.
(*c*) Area of section *C* ($10' \times 12'$) = —— sq. ft.
(*d*) Area of section *D* = —— sq. ft.
(*e*) Area of back of roof ($25' \times 38'$) = —— sq. ft. (no projections).
Total = —— sq. ft.
(*f*) Cost at 25¢ per square foot = \$——.

2. If one gallon of paint covers 250 sq. ft. two coats, how any gallons are needed to paint this house? Make no de- ctions for windows and doors and the various small projec- ns, moldings, etc., as they require more paint than the ainer surfaces.

(*a*) Area of gable end, *G* = —— sq. ft.
(*b*) Area of side below, H = —— sq. ft.
(*c*) Area of front ($9' \times 35'$) = —— sq. ft.
Total area of front and side —— sq. ft.

(*d*) Double this total area to get the approximate area of l four sides.

(*e*) Add to this the areas of the two front sections of the azza, *E* and *F*, also the two ends (*K* and its opposite). The m is the approximate area to be painted.

(*f*) Compute the entire number of gallons. Call any frac- n of a gallon, an entire gallon. Find the cost at \$1.65 per llon.

3. The second building shown on p. 148 is roofed with slate, which costs when laid $12.20 per square. Compute the total cost of the four main roofs, arranging your work as follows:

(*a*)	Area of side	= —— sq. ft.
(*b*)	Area of front end	= —— sq. ft.
(*c*)	Area of one side and end	= —— sq. ft.
(*d*)	Area of other side and end	= —— sq. ft.
	Total area of roof	= —— sq. ft. or —— squares.
(*e*)	Cost at $12.20 per square	= $——.

4. Compute the area of ***each separate section*** (*A*, *B*, *C*, etc., of above roof). If a section is somewhat irregular, regard it as if it were the nearest regular figure. For example, regard *B* and *E* as rectangles 8 ft. × 12 ft.

Section *A* contains	—— sq. ft.
Section *B* contains	—— sq. ft.
Sections *D* and *E* (same as *A* and *B*)	—— sq. ft.
Section *C* contains	—— sq. ft.
Section *F* (same as *C*)	—— sq. ft.
Piazza roof contains	245 sq. ft.
Back roof (18′ × 32′) contains	—— sq. ft.
Total area of roof	—— sq. ft.

5. How many squares are there? How many thousand shingles are needed? Find their cost at $3.50 per M.

HEATING PROBLEMS

1. Compute the number of cubic feet of air in a room 14 ft. ng, 12 ft. wide, and 8 ft. high.

2. If it is a living room with only one side exposed to the eather, and is to be heated by hot-water radiators, there ould be 1 sq. ft. of radiating surface to every 40 cu. ft. of air. ow many square feet of surface must the radiator have?

3. If the living room had windows on three sides, 1 sq. ft. radiating surface might be needed for every 25 cu. ft. of air. ow large a radiator would the above room require in this case?

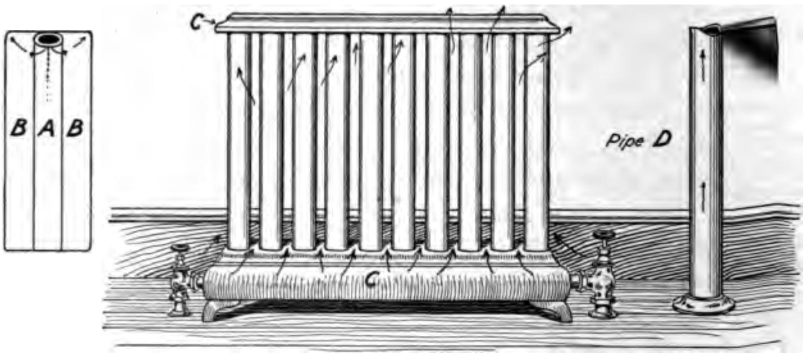
4. Most people do not want sleeping rooms as warm as living oms. A sleeping room with windows on one side needs sq. ft. of radiating surface to 50 cu. ft. of air. How many uare feet of radiating surface are required for such a room ft. × 12½ ft. × 9 ft.?

5. A large manufacturer of heaters requests the owner of e house to fill in the following statement as to the size of oms, etc., in order that he may install radiators of suitable e. Fill in all spaces in which question marks occur.

Name of Room	Dimensions			Cubic Feet of Air	Dimensions of Exposed Walls		Square Feet of Exposed Walls
	Length	Width	Height		Length	Height	
Parlor	18′	15′	9′	?	18′	9′*	?
					15′	9′*	?
Sitting room	14′	15′	9′	?	14′	9′	?
Dining room	16′	14½′	9′	?	14½′	9′	?
Bedroom	14′	12½′	9′	?	12½′	9′*	?
					14′	9′*	?
Chamber	15′	13′	8½′	?	15′	8½′*	?
					13′	8½′*	?
Chamber	12′	13′	8½′	?	12′	8½′	?

* Two walls exposed. Find area of both.

RADIATORS



The greatest of modern conveniences is the heating of our houses by steam or hot water. The water is heated in a single heater in the cellar, and the resulting steam (or hot water) rises through pipes ascending to *radiators* in the rooms above. It passes through the pipes of which these radiators are constructed, making them hot like the sides of a stove. Cool air from the room circulates among these pipes, as shown in *C*, and as it becomes warmed, rises up through the radiator into the room. As long as the pipes are kept hot, the air warmed by them continues to rise and diffuse through the room, while the cooler air near the floor flows in toward the radiator, lifting the warmer air upward and itself becoming heated, until the entire air of the room is comfortably warm.

The most modern radiators are not made of wrought-iron pipe, but rather of cast-iron sections usually highly ornamented. The principle of radiation is exactly the same, although the exact radiating surface would be more difficult to compute. The area or radiating surface is expressed to the nearest square foot.

Amount of Radiating Surface in a Radiator

Facts to know:

Area of a rectangle = width × length (in square units).

Circumference of circle = 3.1416 × diameter.

1. If *A* (page 152) represents an iron pipe 2″ in diameter, hat is its circumference?

2. If this pipe could be unrolled like a sheet of paper, as own in *B*, how wide would the resulting rectangle of iron ? If the pipe is 32 in. long, the area of the rectangle is 2832 × 32 sq. in.

3. How many square inches of *radiating surface* would this pe have if full of steam?

4. Suppose the radiator *C* to be constructed of such pipes. ow much radiating surface has the whole radiator (not count- g top and bottom sections)? Express the answer first as uare inches, then as square feet.

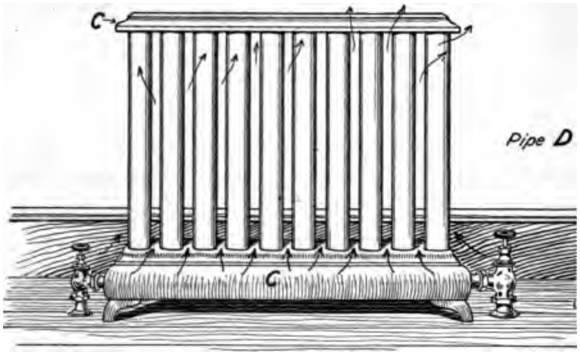
5. Compute the radiating surface (in square inches) of a pe radiator made of 12 pipes 2 in. in diameter, each 35 in. gh. Change this to square feet.

6. Compute the radiating surface of a pipe radiator consist- g of two rows of 2-inch pipes, 10 in a row, 35 in. high. Ex- ess the answer as square feet.

7. The pipe *D* in the sketch on page 152 is a 3″ pipe passing ward through a room that is 9 ft. high. How many square et of hot radiating surface are there when the pipe is full steam? Why was this pipe not run up inside the partition?

8. Compute the number of square feet of radiating surface in 3-inch pipe passing upward through a room $10\frac{1}{2}$ ft. high.

RADIATORS



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FLOOR SPACE IN SCHOOLROOMS

Schoolrooms should be constructed so that there are at least sq. ft. of floor space for each child.

1. How many square feet per pupil are there in room No. 1 he plan on page 154 if 40 pupils are seated in the room?

2. In Room No. 2, 45 pupils are seated. How many square t of floor space are there per pupil?

3. In Room No. 7, there are 46 pupils. How many square t are there per pupil?

NOTE. — A modern school building is designed to contain 200 cu. ft. of per pupil. Each room shown in the plan is 13 ft. high.

4. How many cubic feet per pupil are there in Room No. 3 0 pupils are sent in at a time?

5. How many cubic feet per pupil are there in Room No. 5 n 42 are enrolled?

6. How many cubic feet per pupil are there in Room No. 6 n 35 are enrolled?

7. It was decided to cover the floor of several of these ms with linoleum, which is sold by the square yard. How y square yards were needed for Room No. 2?

8. What was the cost of covering the floor of Room No. 7 $1.80 per square yard? (Call any fraction an extra yard.)

9. The Teachers' Room was covered with the same grade inoleum. How much did it cost?

10. Compute the cost of covering the library floor with the e grade of linoleum, not deducting for the small indenta- n. (Count the fractional remainder as one square yard.)

11. A 6-foot strip of linoleum was laid the entire length of corridor (91 ft.). How many square yards were needed?

APPLICATIONS OF PERCENTAGE

WHOLESALE AND RETAIL PRICES

In the following table, compute the cost of a single package, etc. Add 25 % for profit, and express the selling price to the nearest cent. (Carry each answer through *mills* only.)

	Cost at Wholesale		Cost of One	25 % Profit	Retail Price
1.	2 doz. pkg. in case for	$ 2.70	?	?	?
2.	3 doz. pkg. in case for	6.75	?	?	?
3.	2 doz. tins in case for	5.40	?	?	?
4.	4 doz. cans in case for	2.40	?	?	?
5.	2 doz. cans in case for	1.75	?	?	?
6.	2 doz. cans in case for	3.50	?	?	?
7.	50 lb. in a box for	14.25	?	?	?

Add $33\frac{1}{3}$ % for profit in the following:

	Cost at Wholesale		Cost of One	$33\frac{1}{3}$ % Profit	Retail Price
8.	36 lb. pkg. in case for	$4.50	?	?	?
9.	36 lb. pkg. in case for	4.05	?	?	?
10.	38 lb. pkg. in case for	7.79	?	?	?
11.	105 cakes in case for	3.90	?	?	?
12.	100 cakes in case for	3.80	?	?	?
13.	24 pkg. in case for	4.50	?	?	?
14.	100 pkg. in case for	4.50	?	?	?
15.	2 doz. cans in case for	2.60	?	?	?
16.	2 doz. cans in case for	3.25	?	?	?
17.	4 doz. cans in case for	2.10	?	?	?
18.	4 doz. cans in case for	2.75	?	?	?
19.	2 doz. cans in case for	7.75	?	?	?
20.	3 doz. pkg. in case for	5.76	?	?	?
21.	4 doz. cans in case for	4.32	?	?	?
22.	50 cakes in case for	3.25	?	?	?
23.	2 doz. cans in case for	3.60	?	?	?

Oral Exercise

1. A certain grade of tea can be bought at wholesale for 75 ¢ per pound, and is usually retailed for $ 1 per pound. What is the per cent of gain?

2. Give the per cent of gain in each of the following:

	Wholesale Price	Retail Price
(*a*) English Breakfast tea	45 ¢	50 ¢
(*b*) Ceylon tea	40 ¢	60 ¢
(*c*) Java coffee	32 ¢	40 ¢
(*d*) Mocha coffee	30 ¢	40 ¢
(*e*) Rio coffee	25 ¢	35 ¢

Written Exercise

1. One case of G. W. soap contains 105 pieces and sells for $ 4.20 at wholesale. The grocer retails it at 5 ¢ a cake. What per cent does he make? How much profit does he make on the case?

2. If a grocer can buy a case (24 pkg.) of Gold Dust for $ 4.32 and retail it at 20 ¢, how much does he make on each package? What per cent of the cost is this? What is his profit on the case?

3. A dealer bought a case of 4 doz. cans of asparagus tips for $ 2.40. He retailed them for 15 ¢. Find the profit on one can, the per cent of gain, and the profit on the whole box.

4. A case of canned lima beans containing 24 cans cost a dealer $ 1.92 and was retailed by him for 15 ¢ a can. What was the profit per can and the per cent of profit?

5. If a case containing 36 1-pound cartons of Cream of Wheat costs $ 4.68 at wholesale, what is the per cent of gain when the cartons are retailed at 15 ¢ each?

6. If 2 doz. tins of Instant Postum can be bought for $ 5.52 and retailed at 25 ¢ a tin, what is the per cent of profit?

APPLICATIONS OF PERCENTAGE

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In the following table, compute the cost of a single package, etc. Add 25% for profit, and express the selling price to the nearest cent. (Carry each answer through *mills* only.)

	Cost at Wholesale		Cost of One	25% Profit	Retail Price
1.	2 doz. pkg. in case for	$ 2.70	?	?	?
2.	3 doz. pkg. in case for	6.75	?	?	?
3.	2 doz. tins in case for	5.40	?	?	?
4.	4 doz. cans in case for	2.40	?	?	?
5.	2 doz. cans in case for	1.75	?	?	?
6.	2 doz. cans in case for	3.50	?	?	?
7.	50 lb. in a box for	14.25	?	?	?

Add $33\frac{1}{3}$% for profit in the following:

	Cost at Wholesale		Cost of One	$33\frac{1}{3}$% Profit	Retail Price
8.	36 lb. pkg. in case for	$4.50	?	?	?
9.	36 lb. pkg. in case for	4.05	?	?	?
10.	38 lb. pkg. in case for	7.79	?	?	?
11.	105 cakes in case for	3.90	?	?	?
12.	100 cakes in case for	3.80	?	?	?
13.	24 pkg. in case for	4.50	?	?	?
14.	100 pkg. in case for	4.50	?	?	?
15.	2 doz. cans in case for	2.60	?	?	?
16.	2 doz. cans in case for	3.25	?	?	?
17.	4 doz. cans in case for	2.10	?	?	?
18.	4 doz. cans in case for	2.75	?	?	?
19.	2 doz. cans in case for	7.75	?	?	?
20.	3 doz. pkg. in case for	5.76	?	?	?
21.	4 doz. cans in case for	4.32	?	?	?
22.	50 cakes in case for	3.25	?	?	?
23.	2 doz. cans in case for	3.60	?	?	?

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MARKING DOWN GOODS

Each of the pieces of furniture in the following list is marked down a certain per cent. The per cent varies, as some pieces are sold on a narrower margin of profit than others and cannot be marked lower than their actual cost to the dealer.

Find the selling price of each :

		Marked Price	Per Cent of Reduction
1.	McKinley rocking chair	$ 14.00	$14\frac{2}{7}$%
2.	Rocker	12.60	10%
3.	Back-cushion rocker	14.50	20%
4.	Davenport	23.70	15%
5.	Corner chair	12.45	6%
6.	Den couch	19.85	5%
7.	Leather davenport	51.50	15%
8.	Hat tree	9.75	$33\frac{1}{3}$%
9.	Hall chest	11.75	8%
10.	Screen	9.75	20%
11.	Bookcase	25.40	40%
12.	Ladies' desk	14.25	20%
13.	Library table	16.65	10%
14.	Dining table	22.25	4%
15.	China closet	32.50	30%
16.	Willow rocker	15.50	10%
17.	Square white brass bed	45.00	$11\frac{1}{9}$%
18.	White iron bed	9.72	$16\frac{2}{3}$%
19.	Colonial rocker	16.40	$12\frac{1}{2}$%
20.	Leather davenport	118.00	15%
21.	China cabinet	64.80	$37\frac{1}{2}$%
22.	Serving table	28.00	$14\frac{2}{7}$%

DISCOUNTS ON GOODS

Certain classes of goods, like furniture, hardware, machinery, ., are often sold to customers living at great distances. The ›ds are catalogued, and customers buy largely from catague description.

t often costs thousands of dollars for a wholesale hardware ıpany to print a new catalogue. This prevents getting out ew catalogue every time prices change. Consequently, a **price**, larger than that actually charged, is printed in catalogue, and a **discount**, large enough to bring the price vn to the current market value is given the customer. This ount can be changed as the market price of the commodity nges. What the customer actually has to pay is called the **price**.

ind the net price of the following at discounts given:

	List Price	Discount	Net Price
1.	\$1.00	10%	?
2.	.75	$33\frac{1}{3}$%	?
3.	.84	$14\frac{2}{7}$%	?
4.	.81	$11\frac{1}{9}$%	?
5.	\$1 50	10%	?
6.	2.10	$14\frac{2}{7}$%	?
7.	3.60	$16\frac{2}{3}$%	?
8.	2.50	20%	?

9. Bill with One Discount

Chicago, Ill., Jan. 3, 1916

Messrs. WILLIAMS & WHITE,
2834 State St., Chicago

Bought of THE PLUMBER'S SUPPLY COMPANY

00 ft.	$\frac{3}{4}''$ iron pipe	$11\frac{1}{2}$ ¢	?	?
50 ft.	$2\frac{1}{2}''$ iron pipe	$57\frac{1}{2}$ ¢	?	?
			?	?
	Discount 68%		?	?
			?	?

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5.	Corner chair	12.45	6%
6.	Den couch	19.85	5%
7.	Leather davenport	51.50	15%
8.	Hat tree	9.75	$33\frac{1}{3}$%
9.	Hall chest	11.75	8%
10.	Screen	9.75	20%
11.	Bookcase	25.40	40%
12.	Ladies' desk	14.25	20%
13.	Library table	16.65	10%
14.	Dining table	22.25	4%
15.	China closet	32.50	30%
16.	Willow rocker	15.50	10%
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18.	White iron bed	9.72	$16\frac{2}{3}$%
19.	Colonial rocker	16.40	$12\frac{1}{2}$%
20.	Leather davenport	118.00	15%
21.	China cabinet	64.80	$37\frac{1}{2}$%
22.	Serving table	28.00	$14\frac{2}{7}$%

Discounts on Electrical Supplies

he following list contains the trade names, list prices, and ounts on certain electrical supplies. The illustrations, riptions, etc., were published in large and expensive cata-ies, and the discounts were taken from the latest **discount ts** sent out by the manufacturers.

find the net cost of each item:

irst find how much the amount purchased would cost at the logue price.

hen deduct the discounts, one at a time, in the order given.

(eep no record of amounts less than 1 cent.)

. 5 Lightning arresters @ $6.40 less 40% and 5%.

. 3 Edison batteries @ $4.40 less 15% and 5%.

. 2 Bell metal gongs @ $23.50 less 30% and 10%.

. 15 Sampson batteries @ $.90 less 50% and 10%.

. 1 Single pulley block @ $4.45 less 45% and 10%.

. 3 Double pulley blocks @ $7.50 less 45% and 10%.

. 500 Expansion bolts at $11.25 per C. less 60% and %.

. 250 Switch boxes @ $.48 less 50% and 10% and 5%.

. Shawmut bushings to the value of $300 less 70% and and 5%.

. 70 Ground clamps @ $.24 less 70% and 10%.

. Conduit fittings to the value of $340 less 45% and 2% 10%.

. 7 Electric fans @ $51.20 less 25%.

. 18 E. M. fans @ $55 less 25% and 5%.

. 80 H. A. H. fans @ $47 less 25% and 10%.

. 50 Lineman's belts @ $2.15 less 33⅓% and 10%.

. 2 Expansion bits @ $2.18 less 50% and 10%.

PART OF PRICE LIST OF THE INTERSTATE HARDWARE COMPANY

	NAME OF GOODS	CATALOGUE OR LIST PRICE	DISCOUNTS	SHIPPING WEIGHT
(a)	Axes	$24.50 per doz.	50 % and 10 %	65 lb. per doz.
(b)	Hatchets	10.00 per doz.	60 % and 5 %	23 lb. per doz.
(c)	Hammers	12.00 per doz.	40 % and 15 %	22 lb. per doz.
(d)	4-inch gimlets	1.30 per doz.	25 % and 10 %	1 lb. per doz.
(e)	$\frac{3}{4}$-inch chisels	7.50 per doz.	25 % and 10 %	$4\frac{1}{2}$ lb. per doz.
(f)	Steel squares	18.00 per doz.	$33\frac{1}{3}$ % and $16\frac{2}{3}$ %	32 lb. per doz.
(g)	Try squares	4.70 per doz.	50 % and 10 %	$4\frac{1}{2}$ lb. per doz.
(h)	24-inch saws	27.00 per doz.	$66\frac{2}{3}$ %	22 lb. per doz.

EXPRESS RATES FROM BOSTON, MASS., TO WATERFORD, ME.

Packages weighing 10 lb. or less . . . . 15¢.
Packages weighing over 10 lb. and not over 15 lb. . . . . . 20¢.
Packages weighing over 15 lb. and not over 30 lb. . . . . . 25¢.
Packages weighing over 30 lb. and not over 45 lb. . . . . . 30¢.
Packages weighing over 45 lb. and not over 60 lb. . . . . . 35¢.
Packages weighing over 60 lb. and not over 75 lb. . . . . . 40¢.

Ill. — A package weighing 9 lb. 4 oz. costs 15¢.
A package weighing 10 lb. 1 oz. costs 20¢.

1. Find the exact net cost *per dozen* of each commodity in the preceding list without regard to express charges.

2. To the exact net cost of each dozen add the exact express charge from Boston to Waterford to get the total cost.

3. Compute the price of a *single* ax, hatchet, etc. (including express charges), down the list, expressing each to the nearest cent.

4. How much must the retailer charge for an ax so as to make a profit of 50 % on the actual cost?

5. What is the entire cost of 3 doz. hammers delivered in Waterford?

6. What is the cost of 2 doz. saws delivered as above?

agging Goods. — In marking the retail price on goods, the is usually indicated above the line in letters, the value of ch is not recognized by the purchaser, and the sale price is ten below the line either in letters or in figures. The tag u appears like the following. $\boxed{\frac{a\,o\,s}{1.46}}$ Each dealer has his code of letters, which he and his confidential clerks recog- readily. In the following problems both the cost and the ng price will be indicated in figures.

'. Compute the retail price of each hatchet if sold so as to a profit of 25%. Write the tag.

. Three dozen hammers were bought at one time. Deduct discounts, add the express charge, and find the actual cost ne hammer. (Express charges on this page refer to table age 164.)

. Compute the selling price, providing for a profit of 25%.

. You have ordered 1 gro. of 4-inch gimlets and 2 doz. of ch chisels from the International Hardware Co. Make the bill properly discounted.

. How much should the express company charge you if the orders were put up in one package?

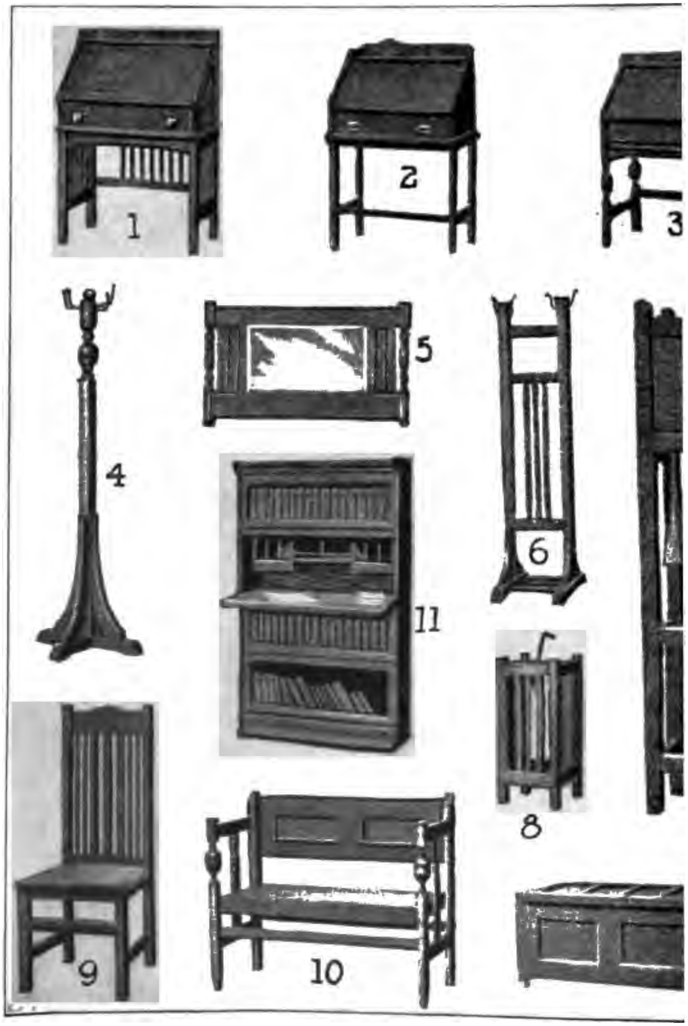
ompute the cost per dozen, including expressage on:

. 1 doz. bronze drawer pulls at $12, less 50% and $37\frac{1}{2}$%. ght, 2 lb.

. 1 doz. sash lifts at $2.20, less 50% and 10%. Weight,

. 1 doz. door handles at $3, less 50% and $33\frac{1}{3}$%. Weight, b.

. 1 doz. copper finished hooks at $2.90 less 10%. Weight,


1
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10

PROFITS AND REDUCTIONS

Compute the retail selling price of each of the following pieces of furniture and mark the tag like the first one below. Write the cost *above the line* and the selling price *below*. Keep these answers for use in Table 2.

TABLE 1

No.	Wholesale Cost	Profit	Tag	No.	Wholesale Cost	Profit	Tag
1.	$15.50	20 %	$\frac{15.50}{18.60}$	7.	$35.00	$14\frac{2}{7}$%	?
2.	12.50	30 %	?	8.	4.50	40%	?
3.	13.00	25 %	?	9.	3.45	20%	?
4.	7.50	10 %	?	10.	12.95	20%	?
5.	6.40	$37\frac{1}{2}$%	?	11.	31.00	30%	?
6.	8.10	$11\frac{1}{9}$%	?	12.	12.20	15%	?

At a clearance sale, prices were cut as follows. Fill in the blanks as in Table 1.

TABLE 2

No.	Selling Price as Marked	Reduction	Actual Selling Price	No.	Selling Price as Marked	Reduction	Actual Selling Price
1.	$18.60	10%	$16.74	7.		$12\frac{1}{2}$%	
2.	See	25%		8.		10%	
3.	results	$33\frac{1}{3}$%		9.		$33\frac{1}{3}$%	
4.	in	20%		10.		$33\frac{1}{3}$%	
5.	above	10%		11.		25%	
6.	table	$33\frac{1}{3}$%		12.		25%	


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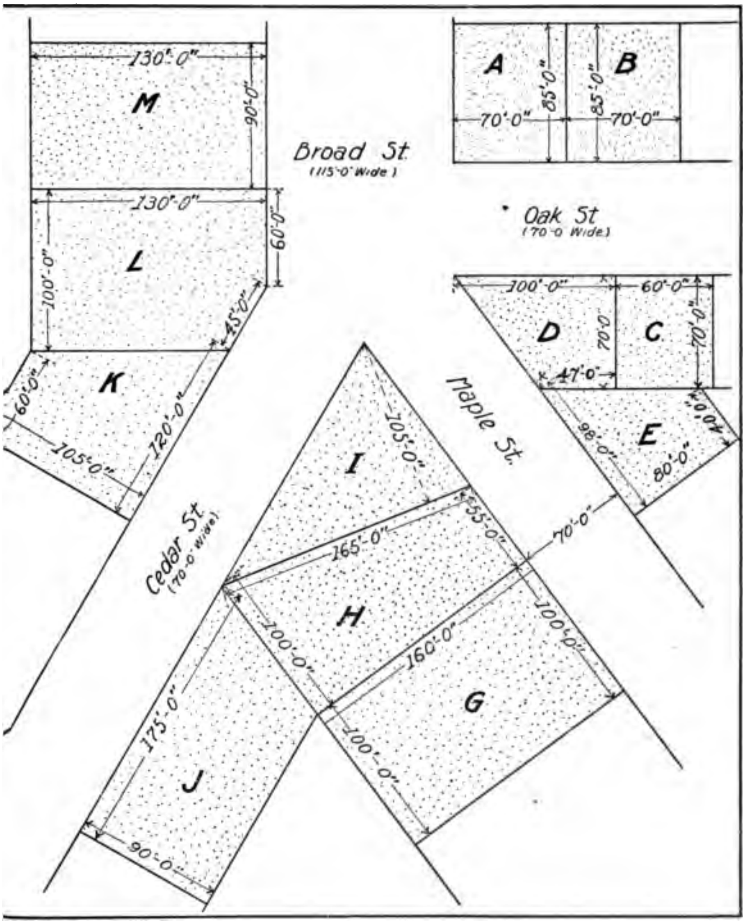
11
12



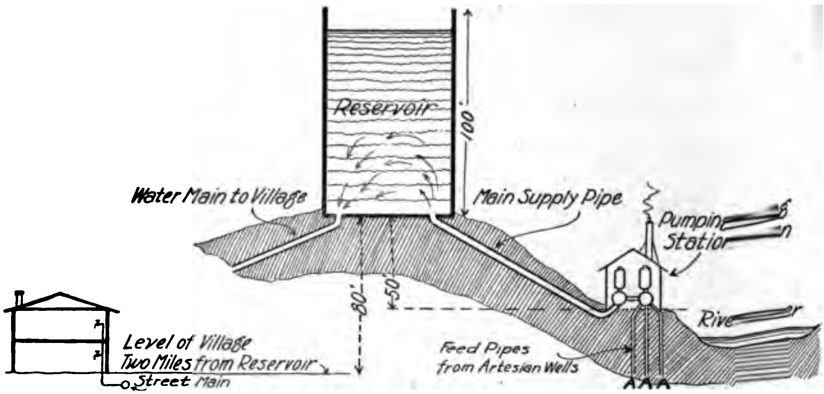
8. Could a tenement house 40 ft. high be placed on lot *G* t came to the edge of the sidewalk?

9. What per cent of *M* would a house 28 ft. × 35 ft. occupy?

10. What per cent of *K* would a house 34 ft. × 42 ft. occupy?

HOUSEHOLD EXPENSES

TOWN WATER SYSTEMS



Facts to be used in solving the following problems:

1. **1 gal. of water weighs $8\frac{1}{3}$ lb.**
2. **There are $7\frac{1}{2}$ gal. in 1 cu. ft.**
3. **1 cu. ft. of water weighs $62\frac{1}{2}$ lb. or 62.5 lb.**
4. **The pressure of water in a tank equals the number of feet in depth times .434 lb.**

1. In the above sketch, the pipes starting from *AAA* conduct the water from artesian wells bored in the hillside through the pump, via a large water main up into a reservoir or stand-pipe on top of the hill. The engine operating the pump can pump 1.47 gal. at a stroke and makes 100 strokes a minute at normal speed. How many gallons does it pump per minute? per hour?

2. Compute the number of gallons it would pump in an 8-hour day.

3. If 1 gal. of water weighs $8\frac{1}{3}$ lb., how many pounds of water would be lifted in a day? how many tons?

4. Refer to the second fact on page 170 and find how many cubic feet of water would be lifted in a day.

5. Compute the cubic contents of your schoolroom. Would this amount fill your schoolroom? How many such rooms would it fill?

6. A larger engine of the same kind pumps 6.12 gal. at a stroke and makes 75 strokes per minute. How many gallons does it pump per minute? how many per hour?

7. How many cubic feet does it pump per minute?

8. How many pounds does it pump per minute?

9. How many tons does it pump per hour?

10. If the standpipe in the sketch is $\frac{3}{4}$ full, the water will stand at 75 ft. Find the pressure per square inch on the bottom of the standpipe.

$$75 \times .434 \text{ lb.} = ?$$

11. The engine and pump are 50 ft. lower than the floor of the reservoir. How many feet of water are there (measured in a vertical line) above the level of the engine?

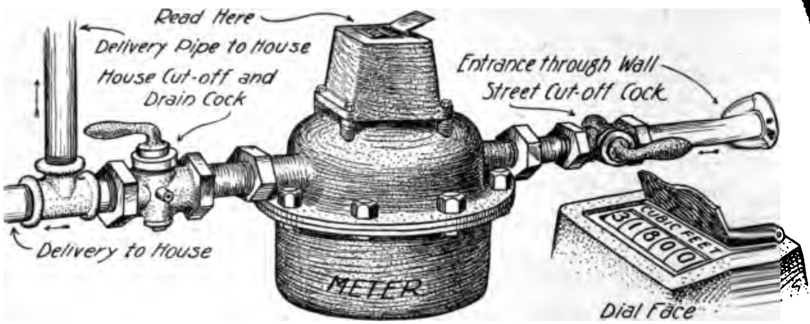
12. The pressure of this water back against the pump is found in the same manner as in problem 10. Compute it.

13. The lowest point in the village is 80 ft. below the floor of the reservoir. Compute the water pressure per square inch when the reservoir is $\frac{9}{10}$ full.

14. If water will rise in any building as high as it stands in the reservoir, how high could a faucet be of use in a building in the village if the water stands 50 ft. in the reservoir?

15. What is the water pressure per square inch in a pipe 30 ft. below the bottom of the reservoir if the latter is 60 % full?

BUYING WATER BY METER



The above cut shows how a meter is attached to the water pipe and where readings are taken.

In some towns, readings are made by an agent of the water company and bills are sent every quarter, that is, every three months. While the meter records the water used in *cubic feet*, the water is usually billed to the consumer in *gallons*. (There are $7\frac{1}{2}$ gal. in 1 cu. ft.)

Making Out Water Charges

Mr. Burton's meter readings for the year, in a small factory, were as follows: Mar. 1, 15,260 cu. ft.; June 1, 31,800 cu. ft.; Sept. 1, 47,210 cu. ft.; and Dec. 1, 63,640 cu. ft.

1. How many cubic feet were used from March 1 to June 1?
2. How many gallons were used?
3. How much did the water cost at 25 ¢ per 1000 gallons?

> 31,800 cu. ft. − 15,260 cu. ft. = 16,540 cu. ft.
> 16,540 × $7\frac{1}{2}$ gal. = 124,050 gal., or 124.05 M gal.
> 124.05 × \$.25 = \$31.01.

4. Answer the same three questions for each of the remaining quarters.

BILL FOR CITY WATER

DATE.............. STREET..............			
MR..........................			
To COLDFIELD WATER CO. DR.			
For water by meter from...........to...........1916			
This meter reading ....cu. ft.			
Former meter reading ....cu. ft.			
Total cubic feet used			
Total gallons used			
Cost at 20¢ per 1000 gal.		?	?
Received payment			
....			
per..................			

5. Copy three blanks like the above. In the city of Coldfield, readings are made every month and billed to the consumer at 20¢ per 1000 gal. The following card contains the monthly readings of Mr. A. S. Sanborn's meter.

(*a*) Make out the bill for water from Jan. 8 to Feb. 10.

(*b*) Make out the bill for water from Feb. 10 to Mar. 15.

(*c*) Make out the bill for water from Mar. 15 to Apr. 18.

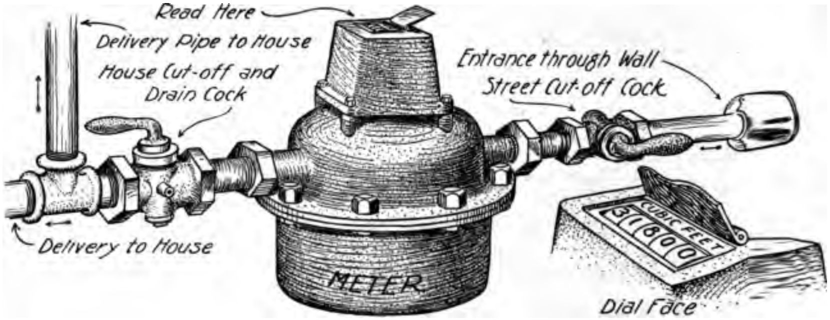
(*d*) Compute the cost of water for each of the months recorded on the card.

WATER METER READINGS
No. 27 LOWELL ST.

Month	Monthly Reading
Jan. 8	16,600 cu. ft.
Feb. 10	17,180 cu. ft.
Mar. 15	17,790 cu. ft.
Apr. 18	18,300 cu. ft.
May 10	18,960 cu. ft.
June 10	19,470 cu. ft.
July 14	20,080 cu. ft.

6. Compute the cost of water for three months, at 25¢ per 1000 gal., if the meter recorded 19,570 cu. ft. at the beginning, and 26,990 cu. ft. at the end.

BUYING WATER BY METER



The above cut shows how a meter is attached to the water pipe and where readings are taken.

In some towns, readings are made by an agent of the water company and bills are sent every quarter, that is, every three months. While the meter records the water used in *cubic feet*, the water is usually billed to the consumer in *gallons*. (There are $7\frac{1}{2}$ gal. in 1 cu. ft.)

Making Out Water Charges

Mr. Burton's meter readings for the year, in a small factory, were as follows: Mar. 1, 15,260 cu. ft.; June 1, 31,800 cu. ft.; Sept. 1, 47,210 cu. ft.; and Dec. 1, 63,640 cu. ft.

1. How many cubic feet were used from March 1 to June 1?
2. How many gallons were used?
3. How much did the water cost at 25 ¢ per 1000 gallons?

31,800 cu. ft. – 15,260 cu. ft. = 16,540 cu. ft.
16,540 × $7\frac{1}{2}$ gal. = 124,050 gal., or 124.05 M gal.
124.05 × \$.25 = \$31.01.

4. Answer the same three questions for each of the remaining quarters.

SUNNYSIDE DISTRICT W. WILBAR 122 Park Ave., City	Month Ending Jan. 20, 1916 To CITY GAS LIGHT CO. Dr. No. 50 Main St.				
		Cost at $1.20 per M		Net Cost	
State of meter this reading	74300 cu. ft.				
State of meter last reading	72400 cu. ft.				
Cubic feet consumed	1900 cu. ft.	2	28		
Discount of 1¢ per 100 ft. if paid before end of the month			19	2	09
Paid, Date, Jan. 30, 1916 per A. C. W.					

:. Verify the above bill. (*a*) Find the number of cubic feet d ; (*b*) Compute the full cost at $1.20 per 1000 cubic feet ; Deduct 1¢ for each *full hundred* cubic feet used.

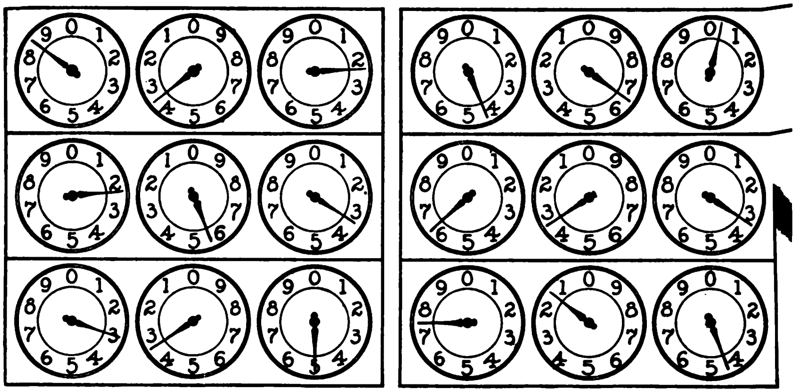
:. Make out a similar bill for R. H. Roscoe, whose meter dings for the same month are as follows :

This reading 42,600 ; last reading 41,300. (He pays the bill ore the end of the month and receives the discount.)

. The following card contains the consecutive readings of lliam R. Thompson's gas meter from January to December 5. Compute his monthly bill at $1.25 per M and consider t he paid each bill before the end of the month, thereby eiving the discount of $ .01 per 100 cubic feet.

Meter No. 7860		William R. Thompson 60 Park Ave. Worcester	
Jan. reading	8,500	July reading	14,200
Feb. reading	9,600	Aug. reading	14,600
Mar. reading	10,500	Sept. reading	16,300
Apr. reading	11,300	Oct. reading	17,900
May reading	12,500	Nov. reading	19,300
June reading	13,800	Dec. reading	20,700

BUYING GAS FOR LIGHT AND FUEL



Most of you are familiar with the gas meter, which is generally attached to the gas pipe just inside the cellar wall. On top of the meter are usually found three dials, in each of which is an indicator, which revolves slowly as the gas is used. In each meter face indicated above, the right-hand dial shows the number of *hundred* cubic feet used. When this dial has moved around once, indicating that 1000 ft. have been used, the indicator on the middle dial moves up to 1, and the right-hand indicator starts around again. Thus it will be seen that the right-hand dial shows *hundreds*, the middle dial, *thousands*, the left dial, *ten-thousands*.

To read the first of the six meter faces above, begin at figure 1 of the left-hand dial and read around 1–2–3 to 8, the *last figure passed*. Do the same with the middle and right-hand dials. Set down the readings from each dial, 832, and annex two ciphers as follows, 83,200 cu. ft. As gas is usually sold by the 1000 cu. ft., move the decimal point three places to the left and you have 83.2 M. In making each reading, be sure to begin with figure 1 and follow around in order and put down *the last figure passed.* Notice that the middle dial is numbered around to the left, the needle turning in a direction opposite to the others.

MAKING OUT ELECTRIC LIGHT BILLS*

n each of the problems on this page consider the prices per W. H. as stated in the following bill:

REDSON ELECTRIC ILLUMINATING CO.
OF BUXTON, KAN.

n account with BURRIL, BROWN & CO. DATE Nov. 6, 1915
247 Center St., City

ELECTRIC SERVICE FROM OCT. 3 TO NOV. 4, 1915

2 K. W. H. @ 12¢	2	64
3 K. W. H. @ 8¢		24
5 K. W. H. used in all	2	88
Discount of ½¢ per K. W. H. used if paid in 15 days		13
	2	75
Received payment,________________19__.		
Signed________________________		

.. Make out a similar bill for Mr. H. T. Waite, whose store Led for a primary demand of 8 K. W. H. and who used 12 W. H. from Nov. 3 to Dec. 2, 1915, and paid within 15 days.

:. Mr. R. S. Stearns's store was wired for lights. He had rimary demand of 13 K. W. H. and used 20 K. W. H. from . 5 to Feb. 5, 1916. Make out his bill with discount as ve.

. Compute the amount paid by each of the following users of ctricity, if each paid his bill in time to receive the discount:

	PRIMARY DEMAND	USED
Mr. Fales	16 K. W. H.	18 K. W. H.
Mr. Belmore	15 K. W. H.	15 K. W. H.
Mr. Forbes	12 K. W. H.	17 K. W. H.
Mr. Harper	12 K. W. H.	14 K. W. H.

* Houses have a flat rate; the rates on stores, hotels, etc., are as above.

BUYING ELECTRICITY FOR LIGHTING

The electricity that we use in our houses enters by means of insulated copper wire and is recorded on an electric meter reading somewhat like the gas meter on page 174. The unit, however, is the **kilowatt hour** instead of the cubic foot. This is a technical term, which means little to the average person, but is as simple a unit to the electrician as the yard is to the dry-goods clerk.

1. Read the meter in the same manner as the gas meter on page 174, substituting kilowatt hours for cubic feet.

The demand made on the system by a store wired for electricity varies with the number of lights. Consequently each store is given a certain rating according to the number of lights, etc., used, the owner being charged accordingly.

2. Mr. Miller's store as wired has a primary demand of 15 kilowatt hours. If he uses 20 K. W. H. (kilowatt hours), he is charged as follows:

Cost of 15 K. W. H. @ $16\frac{2}{3}$¢	=	$2.50
Cost of 5 K. W. H. @ 10¢	=	.50
		$3.00

From this it will appear that the amount he uses above the primary demand costs him less (in this case 10¢).

3. Mr. Pratt's store has a primary demand of 12 K. W. H. and he uses 15 K. W. H. in January. Complete the items in his January bill as follows:

Cost of 12 K. W. H. @ $16\frac{2}{3}$¢	=	$?
Cost of 3 K. W. H. @ 10¢	=	?
		$?

THE TAX RATE

The money for supporting the public schools, for building and hting streets, for maintaining police and fire departments, ., all comes from the people, in the form of taxes. The govment adds together all amounts to be raised by taxation and ides the sum by the assessed valuation of the taxable propy in the town or city, thus obtaining the **tax rate.**

1. A town whose taxable property amounts to $3,000,000 is liged to raise $45,000 by a tax on property. Find the tax rate.

$$\frac{45,\cancel{000}}{3,0\cancel{00},\cancel{000}} \text{ of } 1\cancel{00}\,\% = \frac{45}{30}\%, \text{ or } 1\tfrac{1}{2}\%, \text{ the tax rate.}$$

2. In a town whose taxable property is assessed for $4,500,000, at will be the tax rate when the town is obliged to raise a perty tax of $54,000? Express this rate in three ways.

3. The amount to be raised by a tax on the property of the vn of Stanwood is $70,400, and the value of property assed is $6,400,000. Express this rate in three ways.

Property is classified for taxation purposes as **real estate** d **personal property**. The former includes land and buildgs and the latter consists of movable property, like automoes, horses, furniture, stocks and bonds, jewelry, etc.

4. The value of personal property in the town of Buford s $2,500,000 and of real estate $5,040,000. On the total lue a tax of $150,800 was levied. What was the rate?

Assessors. — During the year, men called assessors carefully spect all real estate and personal property within the town or y limits. Their estimates of the value of all taxable propers found are recorded as shown on the next two pages. The x of each individual is computed from the records made by e assessors.

ASSESSING TAXABLE PROPERTY

LEFT PAGE OF ASSESSORS' BOOK (abbreviated)

NAMES OF PROPERTY OWNERS ON MAPLE AVE.	NO. POLLS @ $2.00	TOTAL POLL TAX	VALUE OF EACH KIND OF LIVE STOCK	OTHER TAXABLE PERSONAL PROPERTY	TOTAL PERSONAL PROPERTY	TOTAL TAX ON PERSONAL PROPERTY
R. Ames	2	4 00	200 70	250	520	7 80
H. Boone	1		150 275	450		
S. Thomas	3		500 350	2000		
H. Lane	2		360 280	1620		
E. Hayes	1		50 160 120	465		
T. Keen	2			1550		

Directions for Filling out the Above Page

1. If any citizen has sons over 21 years of age, living at home or attending college, as in the case of Mr. Ames, the number of poll taxes is *more than one*. Fill in the "Poll Tax" column for each property owner listed above.

2. Add the items in the "Live Stock" and "Other Personal Property" columns to get the amount to record in the "Total Personal Property" column for each taxpayer.

3. Find the "Total Tax on Personal Property" as follows:

Mr. Ames has \$520 worth of taxable personal property.
The tax rate this year is \$15 on \$1000, or \$.015 tax on **\$1**.

520 × \$.015 = \$7.80.

4. Compute this tax for each taxpayer.

ASSESSING TAXABLE PROPERTY — (*continued*)

RIGHT PAGE OF ASSESSORS' BOOK (abbreviated)

NAME	VALUE OF BUILDINGS, NOT INCLUDING LAND	VALUE OF EACH LOT OF LAND	TOTAL VALUE OF EACH PARCEL OF REAL ESTATE	VALUE OF ALL REAL ESTATE	TOTAL TAX ON REAL ESTATE	TOTAL … POLL PERSO… ESTA… REAL E…
R. A.	4100	1200	5300	8300	124 50	4
	2000	1000	3000			7
						124
						136
H. B.	1500	750				
		800				
S. T.	1750	800				
	2200	1000				
H. L.		800				
		550				
E. H.	3000	1700				
	2500	1400				
T. K.	4700	2100				

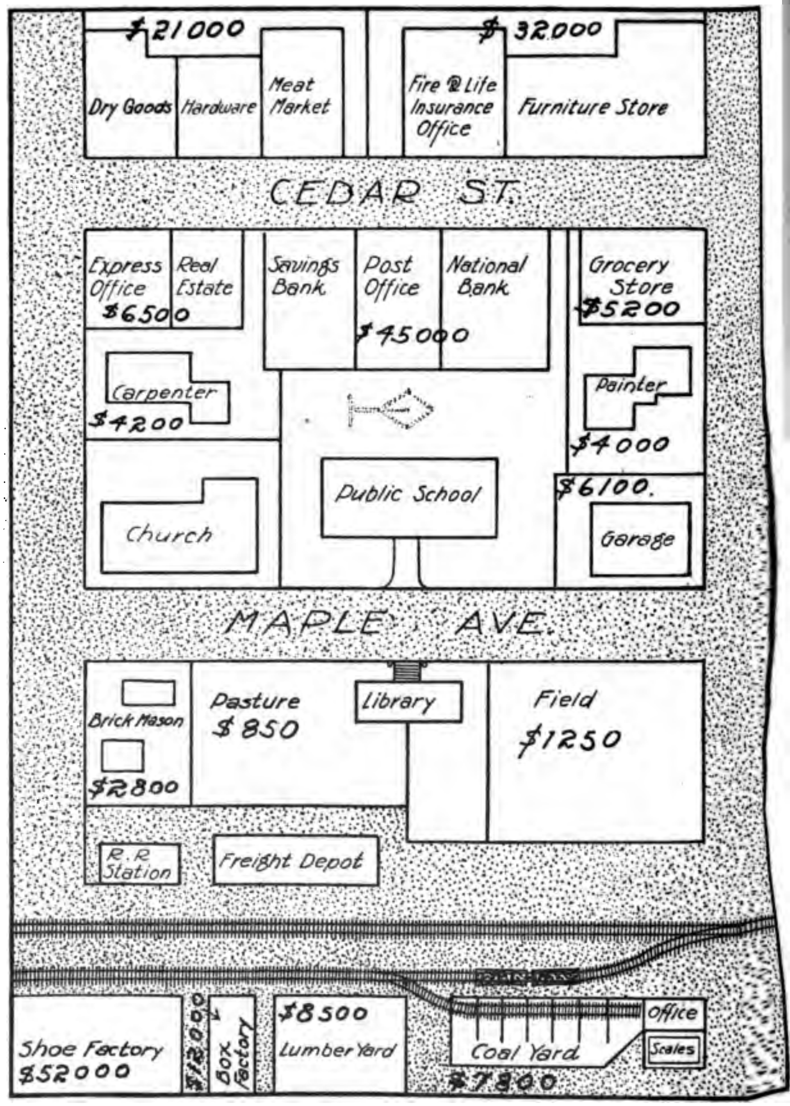
Directions for Filling out the Above Page

5. The values of houses and land are assessed separat… To fill in the "Total Value of Each Parcel of Real Est… column, add horizontally, when there is a building on the… as shown opposite Mr. Ames's name. Do this for each… payer.

6. The sum of the items just obtained for each man g… the "Value of all Real Estate." Fill out this column.

7. Compute each man's "Total Tax on Real Estate" at… per $1000 as in example 3.

8. Add the three taxes to obtain each man's "Total T… (See Mr. Ames's record.)


$21000
Dry Goods
Hardware
Meat Market
$32000
Fire & Life Insurance Office
Furniture Store
CEDAR ST.
Express Office
Real Estate
$6500
Savings Bank
Post Office
National Bank
$45000
Grocery Store
$5200
Carpenter
$4200
Painter
$4000
$6100.
Church
Public School
Garage
MAPLE AVE.
Brick Mason
$2800
Pasture
$850
Library
Field
$1250
R.R. Station
Freight Depot
Shoe Factory
$52000
$12000
Box Factory
$8500
Lumber Yard
Office
Scales
Coal Yard
$7300

COMPUTING REAL ESTATE OWNERS' TAXES

1. How much did the owner of the block containing the lry-goods and hardware stores and the meat market have to pay n 1907 when the rate was $14.50 per $1000?

2. If the rate went down to $13.75 per $1000 in 1908, how nuch did the owner of the block containing the insurance office nd furniture store have to pay?

3. In 1909 the rate was $14.20 per $1000. How much was hat per $100? How much did the owner of the express and eal estate offices have to pay?

4. In 1910 the rate was $14.75 per $1000. How much vas that per $100? How much did the owner of the block ontaining the banks and post office have to pay?

5. In 1911 the tax rate was $16. How much was this per ollar of taxable property? How much did the owner of the rocery store have to pay that year?

6. In 1912 the tax rate dropped to $15.80 per $1000. What per cent did it drop from the rate in 1911? Compute he tax on the carpenter's house.

7. In 1913 the rate jumped to $17 per $1000. Compute he tax on the garage.

8. In 1914 the rate was $17.40 per $1000. Compute the ax on the brick mason's house.

9. In 1915 the rate was $17.50 per $1000. Express this n three other ways. How much did the man who owned the elds on both sides of the library have to pay?

10. Compute the tax in 1915 on the shoe factory; on the ox factory; on the lumber yard; on the coal yard.

THE TAX RATE

(A Yearly Problem for Assessors of Taxes)

The class, by following each of the numbered directions, will take the main steps in finding the tax rate for the current year.

1. Add the following items to get the total amount voted by the town at its annual town meeting:

Support of poor,	$ 4,500	Sum of first column,	$?
Support of schools,	27,000	Memorial day,	175
Support of library,	1,600	Tree warden,	1,000
Roads and bridges,	5,000	Town officers,	2,800
State road,	3,000	Soldiers' relief,	200
Street lighting,	2,200	Health department,	500
Fire department,	3,500	Abatement of taxes,	600
Police,	1,200	Interest,	1,500
Fighting moths,	1,420	Printing,	500
Incidentals,	2,000	Total	?
Add and carry forward,	? ?		

2. Add to this last amount the town's share in the state tax ($6500) and its share in the county tax ($4300).

3. Poll taxes amounting to $3200 and certain other income to the town amounting to $3295 are to be subtracted from the total obtained in problem 2. Why?

4. The amount remaining must be raised by direct tax on the property of the town, which is valued at $4,200,000. Divide the *amount to be raised* by the *valuation* and carry out the quotient three decimal places. The result is the number of cents and mills which constitute the tax on $1 of property valuation.

5. Express this amount as a tax on $100.

6. Express the amount as a tax rate per $1000.

Computing the Tax Rate

The following money must be raised in Marshfield by taxa-
n. Compute the tax rate as on the preceding page:

1. Amounts appropriated at the annual town meeting.

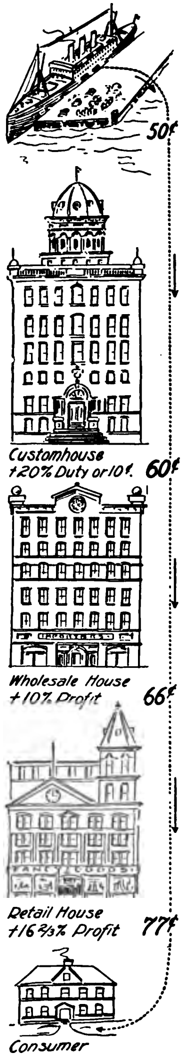
Support of the poor,	$ 4,500	
Support of schools,	35,000	
Support of library,	1,800	
Roads and bridges,	5,000	
Special state road,	3,000	
Street lighting,	3,400	
Fire department,	4,000	
Police department,	1,200	
Gypsy and brown tail moth,	1,543	
Incidentals,	2,000	
Memorial Day,	185	
Tree warden,	700	
Town officers,	4,000	
Soldiers' relief,	300	
Health department,	500	
Abatement of taxes,	600	
Interest,	2,000	
Printing and advertising,	500	
Note,	5,000	
Additional items,	2,700	
Total		$?

2. Marshfield's share of the state tax 8,800

Marshfield's share of the county tax 5,660
Total amount to be raised . . . . $?

3. Subtract from this total the amount of the poll tax and income from any other sources 9,588
Total amount to be levied on taxable property ?

4. Divide the last amount by the total valuation ($4,600,000) l carry the quotient out three decimal places. This gives cents and mills the tax on one dollar of property valuation.



DUTIES ON IMPORTED GOODS

The most expensive business in the world is that conducted by the governments of the great nations. They must be regularly supplied with money to carry on the many different enterprises which their various departments control. In our country most of the funds come from taxes on imported goods.

For example, a cheap grade of woolen carpet imported from Europe is valued at 50¢ per yard on shipboard. Before the wholesale dealer can put it into his warehouse, he must pay to the customhouse official 20% of the value of his consignment. This brings the cost of the carpet up to 60¢ per yard. Before selling to retail dealers in different towns, the wholesale dealer adds 10% to pay him for handling and a reasonable profit. This brings the cost up to 66¢. The retail dealer may add $16\frac{2}{3}\%$ for similar reasons, and when the consumer gets the carpet, he may pay 77¢ per yard for it.

What different items does this 77¢ include? Who really pays the tax?

By this method of taxation the average buyer is seldom aware that there is included in the price of many of his purchases a small government tax.

Discuss the things governments do, how they spend money, and how we all benefit by this expenditure.

Some goods are subject to an **ad valorem duty**, which is a per cent of the value; some to a **specific duty**, a given amount per pound, gallon, etc.; some have both kinds of duty; and some are free of duty.

1. If a merchant receives a consignment of 2000 yd. of carpet at 50¢ a yard, how much does the customhouse collect from him in duties at 20%?

2. If a customer buys 18 yd. of this carpet from a retail dealer, how much does the customer contribute toward the support of the Federal government?

3. A certain grade of sardines is worth 24¢ a can on shipboard. There is a duty of 25%. How much duty does 1 can cost the importer? 1000 cans?

4. For how much must he sell each can to clear $33\frac{1}{3}\%$ profit?

5. Figs for which we pay 20¢ per pound are worth about $5\frac{1}{2}$¢ per pound on shipboard. There is a duty of 2¢ per pound. How much of the retail price is dealers' profit?

6. A wholesale grocer imported 500 gal. of olives worth 75¢ per gallon. He had to pay 15¢ per gallon duty. How much did the government receive?

7. A consignment of 1260 lb. of wool yarns, whose average value is 32¢ per pound, is subject to an 18% duty. How much does the importer have to pay the customhouse? What does the consignment cost him, including the duty?

8. The value of sugar imported one year was $106,047,640. An average duty of 58% was collected on this. How much money in the form of duty on sugar did the people contribute to help maintain the Federal government?

9. About $10,000 worth of perfumery was imported by a certain firm. The duty was 60%. What was the total duty?

FEDERAL INCOME TAX

The United States Congress passed an act in 1913 requiring individuals to pay a tax on incomes as follows:

A normal tax of 1% on net incomes from salaries, profits, etc., in excess of $3000 for a single man or woman, or $4000 for a man and wife living together.

An additional tax on net incomes exceeding $20,000, as follows:

1% on the amount over $20,000 and not exceeding $50,000.
2% on the amount over $50,000 and not exceeding $75,000.
3% on the amount over $75,000 and not exceeding $100,000.
4% on the amount over $100,000 and not exceeding $250,000.
5% on the amount over $250,000 and not exceeding $500,000.
6% on the amount over $500,000.

Every person whose net yearly income is over $3000 is required to file an accurate return of his income before March 1 of each year.

1. Find the Federal income tax on a single man's taxable net income of $73,000.

Normal Tax of 1%: $73,000 – $3000 = $70,000, subject to a tax of 1%. 1% of $70,000 . . . . $ 700

Additional Tax: From $20,000 to $50,000 = $30,000, subject to an additional tax of 1%. 1% of $30,000 . . . . $ 300

From $50,000 to $73,000 = $23,000, subject to an additional tax of 2%. 2% of $23,000 . . . . $ 460

Total tax $1460

Notice that the $3000 exemption (or $4000 for married couples) is allowed *only* in finding the *normal tax*.

2. Divide the following large incomes of unmarried men to show how they would be taxed under this law:

(*a*) $23,000	(*e*) $63,000	(*i*) $ 70,000
(*b*) $27,000	(*f*) $88,000	(*j*) $100,000
(*c*) $18,000	(*g*) $93,000	(*k*) $150,000
(*d*) $ 9,000	(*h*) $ 4,500	(*l*) $ 13,000

3. How large an income tax would an unmarried woman be expected to pay on a taxable income of $58,000?

Normal Tax: $58,000 – $3000 = $55,000.		
	1% of $55,000	$ 550
Additional Tax: From $20,000 to $50,000 = $30,000.		
	1% of $30,000	$ 300
From $50,000 to $58,000 = $8000.		
	2% of $8000	$ 160
	Total income tax	$1010

4. Compute the income tax on the following taxable incomes received by unmarried men or women during the year 1915:

(*a*) $ 5000 (*c*) $21,000 (*e*) $ 78,000
(*b*) $10,000 (*d*) $60,000 (*f*) $200,000

5. Mr. James, married, had a net income from his business this year of $34,800. Compute his total income tax.

6. Miss Kimball owned a block and several apartment houses. How much did she have to pay on a year's income of $24,500?

7. Mr. Lane, married, had an income derived from different investments as follows: $15,260, $4370, $18,100, and $12,600. What was his total income for the year? Compute his income tax.

8. Mr. Drew, single, had a salary of $4000 and received a commission of 1% on a $250,000 business. What was his income? Compute the total income tax.

Compute in similar manner the total income tax on the net income of each of the following men:

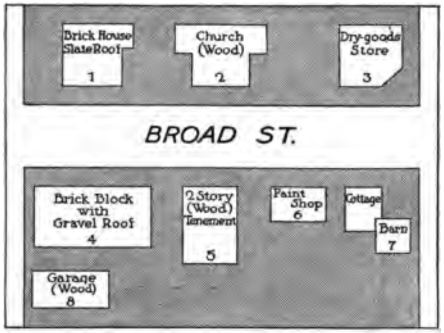
9. Mr. Garrison, single; salary $5000; from real estate transactions $18,500.

10. Mr. Harper, married, net income from purchase and exportation of grain $55,700.

11. Mr. Moore, married, wholesale dealer and importer, whose books showed a net income of $48,600.

FIRE INSURANCE

This plan shows the arrangement of buildings fronting on Broad Street. The walls and roofs of these buildings are constructed of different materials; which affect their liability to catch fire. The different purposes for which they are used also affect the fire risk. Insurance companies are not willing to insure certain types of building for more than one year at a time. Other buildings are insured for a five-year term. The following table gives the insurance rate for each of the above buildings.



The **premium** is the amount which a person pays for his insurance. It is paid every year; or, in many cases, once in three or five years. It is expressed as a certain number of cents on $100 of value.

Number of Building	Charge for Every $100 Worth of Insurance for 1 Year	Number of Building	Charge for Every $100 Worth of Insurance for 5 Years
2	$ .75 (building)	1	$ .50
	.90 (furniture)		
	1.05 (organ)		
3	1.20 (building)	5	.75
	1.80 (contents)		
4	.90		
6	3 % of amount insured	7	.75 (for cottage)
8	$2.50		.90 (for barn)

Explain why the rates differ on the various buildings.

. Mr. Pierce takes out a 5-year policy for $6000 on the :k house (No. 1). How much does it cost him?

:. If the insurance on the church edifice (No. 2) is $8000, the furniture, $1500, and on the organ, $1000, what is the rly cost of insurance to the church?

. The owner of the dry-goods store (No. 3) insures the lding for $2400 and the stock for $1800. Find the annual t.

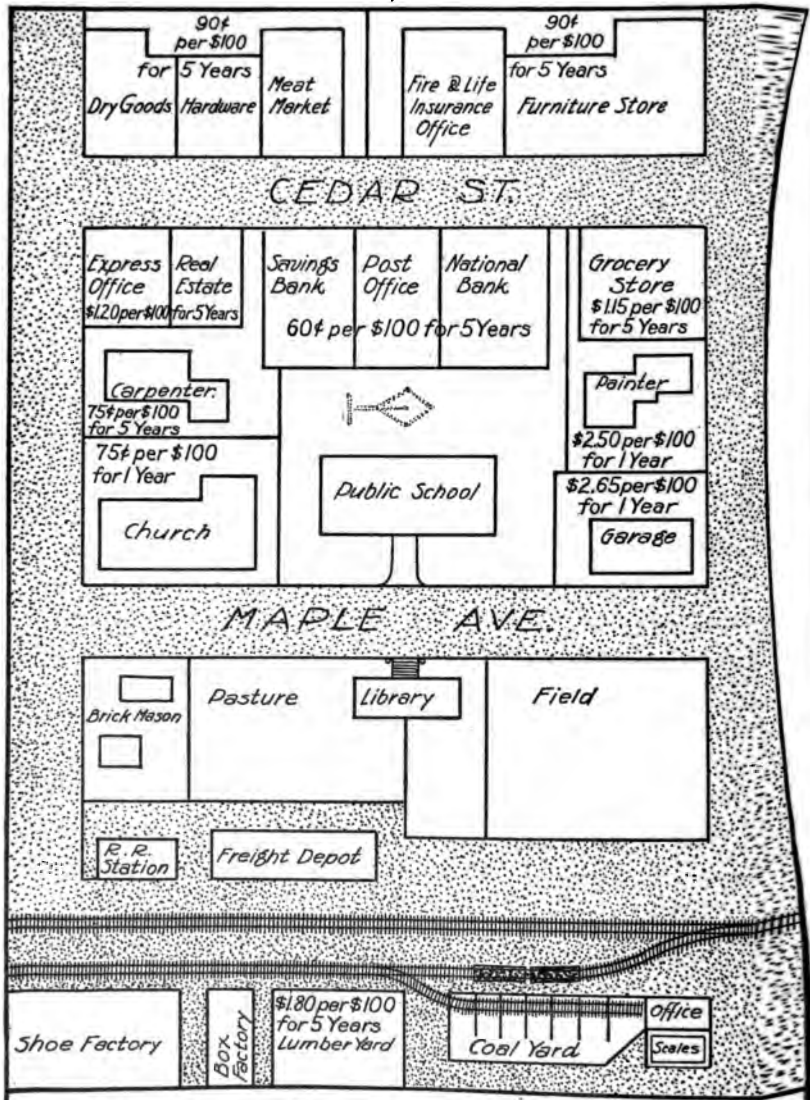
. The Riverside Real Estate Company insures the brick ck (No. 4) for $18,000. How much does it cost per annum? $2500 is added to the insurance now carried, how much does add to the yearly premium?

. Mr. Reed, owner of the tenement (No. 5), carries $4000 ırance. He leases the two tenements and intends to increase rent next year so that the tenants shall pay the insurance. w much will this add to the year's rent of each tenant if each 's the same amount? How much will that be per month?

. The owner of the paint shop (No. 6) takes out $2100 ırance on the building and $500 insurance to cover car- ;es and other articles which are in his shop to be painted, l for which he is responsible to the owners. How much st he pay in annual premium?

. Mr. Bemis takes out $2700 worth of insurance on his tage (No. 7) and $1350 on the barn. How much does it cost ı for five years?

. A fire destroyed the garage (No. 8) and its contents. garage cost $3860 originally, and the owner had to pay for nage done to three automobiles as follows: $250, $875, 250. He carried $5000 worth of insurance which was paid 'ull. Compute his loss.



BUSINESS ELEMENTS IN A COMMUNITY

VILLAGE FIRE RISKS

he following problems relate to buildings shown in the)site plan. The premium in each case is for five years ne year, as indicated, and the rate is on $100 of property e. The premium is paid at the time when the building sured for the term of insurance specified.

.. The stores north of Cedar Street are in brick blocks. The k containing the dry-goods store is insured for 5 yr. for ,000. How much does the proprietor pay? How much is *per year?*

!. The block containing the furniture store is insured for . for $28,000. What is the premium? How much does insurance cost per year?

!. The express and real estate offices (wooden buildings) are block insured for 5 yr. for $4200. What is the premium?

!. The post office is in a block of brick buildings with gravel s, insured for $38,000. What is the 5-year premium?

!. The grocery store is insured for 5 yr. for $4550. What he premium?

;. The painter carries $3500 insurance on his house and). What is his yearly insurance bill?

'. The carpenter, who lives across the school grounds from painter, has no special fire risk to make his rate of premium ı. He is insured for $3500 for 5 yr. How much less per : does he pay than the painter?

!. Find the yearly cost of $5500 insurance on the garage.

). The church carries insurance for $10,500. How much t it pay annually for this protection?

). Find the 5-year premium for $7500 insurance on the ber yard.

SIMPLE HOUSEHOLD ACCOUNTS

YEARLY CASH ACCOUNT

Mr. Brown wishes to make a careful study of the way in which his money is spent. He and his wife resolve to keep pocket memoranda of their expenses. These are transferred at the end of the month to an account sheet as shown on the next page, which the pupils are to copy.

1. Add the January items to get the total expenditure.

2. Subtract it from the monthly income to get the unexpended balance for January.

3. **Account for February**: In February Mr. Brown bought 2 T. of coal at \$8.75 per ton; paid a girl \$16 per month for domestic services; hired a man at \$.30 per hour for three 8-hour days; paid for renewing the insurance on his furniture to the value of \$1000 at $\frac{1}{4}$%. His rent was \$20.00; he spent for meat \$10.80; for clothing, \$40.25; for house furnishings, \$5.82; for gas, \$1.95; for milk, 56 qt. @ \$.09; for laundry, \$2.40; for carfare, \$1.80; for amusements, \$2.75; for church, \$4.00; and for miscellaneous expenses, \$5.60. Copy each of the above in its proper place and then complete the grocery bill below and record the amount under "groceries." Compute the totals as for January.

Feb. 28, 1916

Mr. Harold T. Brown

To KEEN, PERKINS & CO., *Dr.*

Feb. 3	Butter .78 Pork .15 Meal .08 Raisins .12		
Feb. 7	Figs .20 Sugar .50 Butter .89		
Feb. 10	Beans .20 Olives .25 Uneedas .05		
Feb. 11	Coffee .35 Sugar .50 Tapioca .08 Clothes Pins .10		
Feb. 15	Broom .50 Soapine .10 Ivory Soap .32		
	Other items amounting to	8	50

following is the cash account for January of Frank T. and his family:

Expense Items	Jan.	Feb.	Mar.	April	May
	$ 20.00				
ries	14.81				
etc.	11.70				
ing	15.50				
Furnishings	4.75				
and Ice	17.50				
	1.84				
	4.19				
r and Medicines	5.55				
lry	.70				
re	2.25				
	20.80				
ements	1.75				
h, etc.	3.00				
ance	2.50				
llaneous	10.50				
Expenses	?				
Income	200.00				
t Expenses					
pended Balance	?				

ccount for March: Rent, $20.00; groceries, $21.10; , $8.60; house furnishings, $5.60; fuel, $13.25; gas, ı. ft. at $1.15 per M; milk, 58 qt. at $.09; doctor and ıe, $8.40; laundry, $1.95; carfare, $2.40; labor, $4\frac{1}{2}$ at $4.00; amusements, $5.25; church, $4.00; miscel-, $6.20. Finish the bill on the following page, record 'meat, etc.," and complete the March account.

March 31, 1916

HAROLD T. BROWN
To CITY SUPPLY CO. *Dr.*

Mar. 1	$3\frac{3}{4}$ lb. Pork	.24		
	2 pk. Potatoes	.35		
Mar. 3	3 cans Peas	.18		
	$1\frac{7}{8}$ lb. Sirloin	.40		
	1 pt. Oysters	.25		
Mar. 6	$2\frac{1}{2}$ lb. Tripe	.08		
	Turnips			25
	Bananas			20
Mar. 7	$2\frac{1}{4}$ lb. Bacon	.20		
	3 lb. Beans	.12		
Mar. 10	$\frac{13}{16}$ lb. Cheese	.32		
	$1\frac{1}{2}$ doz. Eggs	.35		
	Other items amounting to		7	56

5. **Account for April**: Rent, $20.00; groceries, $18.95; meat, $12.34; clothing, $50.75; house furnishings, $10.90; fuel, $10.50; milk, $5.40; medicines, $1.50; laundry, $2.60; carfare, $1.85; labor, $18.00; amusements, $4.65; church, $4.50. Compute the gas charges for April, meter readings 162,500 to 164,500, gas costing $1.15 per M, discount 10¢ per 1000 ft. used. Complete the April account.

6. **Account for May**: Rent, $20.00; groceries, $24.85; meats, $13.05; clothing, $42.20; house furnishings, $4.60; 2 T. coal at $8.25 less $.50 for cash; gas, 1800 ft. at $1.15 per M., with discount as in Ex. 5 for cash payment; milk, $6.03; laundry, $3.50; carfare, $2.25; labor, $18.00; amusement, $3.90; church, $5.00. Complete the May account.

7. Add the unexpended balances for the five months. At this rate, how much can Mr. Brown save in a year?

INCREASED COST OF LIVING IN TEN YEARS

TABLE OF COST OF STAPLE FOODS

Food	Average Cost in 1900		Average Cost in 1910	
	Wholesale	Retail	Wholesale	Retail
Bread Flour	4.15	4.70	6.40	7.50
Butter	.29	.30	.34	.35
Sugar	.04¾	.05	.05¼	.06

. How much did the wholesale cost of flour advance in ten rs? What per cent did it advance?

. How much did the retail cost advance in ten years? at per cent did it advance?

. The retail price in 1900 was what per cent higher than the ›lesale price? (This we call the margin of profit.)

. The retail price in 1910 was what per cent above the ›lesale price? Was the margin of profit any greater in 1910 ı in 1900?

. Answer the same four questions for butter; then for sugar.

INCREASE IN WAGES IN FIFTY YEARS

Trade	Wage in 1860	Wage in 1910	Some Present Wages
Shoe Cutters	$12.00	$18.00	$21.00
Carpenters	9.92	20.00	25.50
Machinists	9.64	16.50	20.00
Typesetters	14.83	26.00	27.50

. What is the per cent of increase in the 1910 wage over the 0 wage in each case?

. The present wage is what per cent higher than the average .910 in each case?

HOW EFFICIENCY AFFECTS THE INCOME

The following table, made from facts recently obtained by an industrial commission, shows the value of efficiency. The lowest wage in each case is paid the poorly prepared and unskilled workmen; the higher wage is received by well-prepared and efficient workmen in the same trade?

WAGES PAID IN RICHMOND, VA.

Trade	Weekly Wage	
	Lowest	Highest
Typesetters	$12.00	$32.00
Pressmen	11.00	22.50
Engravers	26.00	30.00
Bricklayers	29.25	31.20

Trade	Weekly Wage	
	Lowest	Highest
Plumbers	$19.50	$24.00
Plasterers	18.00	24.00
Machinists	12.00	20.00
Pattern makers	18.00	22.50

1. What is the per cent of increase due to efficiency in the case of each of the following trades?

(*a*) The typesetters.
(*b*) The pressmen.
(*c*) The engravers.
(*d*) The bricklayers.
(*e*) The plumbers.
(*f*) The plasterers.
(*g*) The machinists.
(*h*) The pattern makers.

2. Counting 45 weeks to the year, how much greater is the yearly income of the efficient workmen than that of the poorer workmen in each of the following trades?

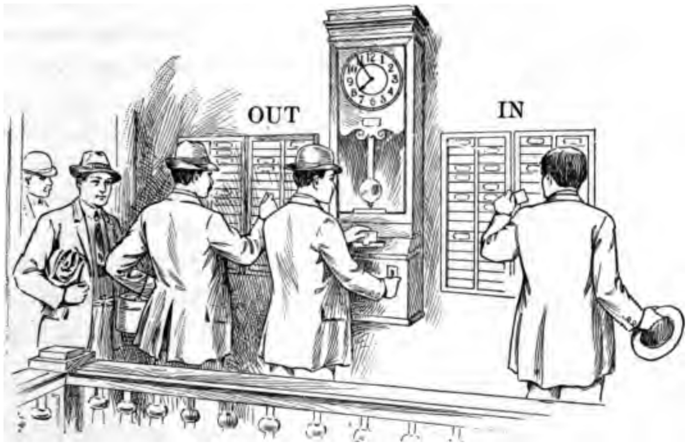
(*a*) The typesetters.
(*b*) The pressmen.
(*c*) The plumbers.
(*d*) The machinists.

3. If the year includes only 40 full weeks, how much greater is the yearly income of the better workmen than that of the poorer workmen in the following trades?

(*a*) The bricklayers.
(*b*) The plasterers.
(*c*) The engravers.
(*d*) The pattern makers.

EARNING A LIVING

THE TIME CLOCK



The above picture shows five employees entering the factory just 5 minutes before time to begin work. As each enters, he takes his card (similar to that on the next page) from its place in the case headed "Out," and as he passes the clock, he inserts the card, pulls down the lever, and leaves his card in the case headed "In."

If we should examine the card, we should find stamped on it "7.55" under the word "In," which tells the timekeeper or paymaster that the employee arrived 5 minutes before 8 o'clock on this particular morning.

This process is repeated four times each working day as the employee goes in or out, and at the end of the week the card will look like the one printed on page 200, which a little study will enable you to understand.

WEEKLY TIME RECORDS

Explanation of the Card. — The regular factory hour this time card was used, were from 8 to 12 and 1 to 5.


WEEK ENDING JAN. 16 1915

No. 275

NAME Geo. Bacon

DAY	MORNING IN	MORNING OUT	AFTERNOON IN	AFTERNOON OUT	TOTAL
MON.	801	1202	1250	503	7¾
TUE.	759	1205	1255	459	7¾
WED.	745	1130	1254	501	7½
THU.	755	1201	1250	505	8
FRI.	753	1200	1259	504	8
SAT.	758	1202	102	500	7¾
SUN.					

TOTAL TIME 46¾ HR.

RATE 30¢ per hour

TOTAL WAGES FOR WEEK $14.03

George Bacon arrived one late. It takes a certain an time for a workman to get to and prepare for work. One of an hour was deducted fi Bacon's time because of his t rival ; so his day was record hr. instead of 8 hr.

Tuesday, he left the fa minute before time at nig must have quit work several earlier ; so ¼ hr. was deduct his afternoon time.

Wednesday, he arrived ¼ fore 8 o'clock, but this did n as the workman doesn't beg until 8 o'clock. He left a which reduced his forenoon 3½ hr.

Unless the employee enters on time or before, begin to time on the first quarter hour after he enters.

If he enters at or before 8, count time from 8; if he enters a from 8.01 to 8.15, count time from 8.15; from 8.16 to 8.30, count from 8.31 to 8.45, count from 8.45; from 8.46 to 9.00, count from

Unless the employee leaves on time or later, count his to the last quarter hour before leaving.

If he leaves at any time from 11 to 11.14, count time until 11; to 11.29 count until 11.15; from 11.30 to 11.44, count until 11.30; to 11.59, count until 11.45; at or after 12, count until 12.

PAYMASTER'S WORK

Verify the daily totals and finish the first two time records. Find the daily totals and finish the others.

1.

WEEK ENDING FEB. 13, 1915.
Name E. R. BARBER

DAY	MORNING		AFTERNOON		TOTAL HOURS
	IN	OUT	IN	OUT	
Mon.	7.50	12.00	12.50	5.02	8 hr.
Tue.	8.10	12.01	12.58	5.03	7¾ hr.
Wed.	8.25	12.05	12.50	5.05	7½ hr.
Thu.	8.13	12.02	12.55	5.06	7¾ hr.
Fri.	8.10	12.00	12.59	5.01	7¾ hr.
Sat.	8.12	12.04	12.50	3.10	5¾ hr.

Total time
Rate per hour 28¢
Total wages

2.

WEEK ENDING FEB. 13, 1915.
Name ERNEST WHITE

DAY	MORNING		AFTERNOON		TOTAL HOURS
	IN	OUT	IN	OUT	
Mon.	7.53	12.04	12.50	5.05	8 hr.
Tue.	8.08	12.01	12.56	5.02	7¾ hr.
Wed.	8.00	12.05	12.50	5.08	8 hr.
Thu.	7.40	12.01	12.51	5.02	8 hr.
Fri.	8.00	12.05	12.56	4.08	7 hr.
Sat.	9.10	12.04	12.49	5.03	6¾ hr.

Total time
Rate per hour 36¢
Total wages

3.

WEEK ENDING FEB. 13, 1915.
Name R. H. MOORE

DAY	MORNING		AFTERNOON		TOTAL HOURS
	IN	OUT	IN	OUT	
Mon.	7.56	12.06	1.00	4.08	
Tue.	7.50	12.00	1.00	4.01	
Wed.	8.00	12.02	12.59	4.03	
Thu.	7.59	12.04	12.50	4.05	
Fri.	7.49	12.02	12.56	4.03	
Sat.	8.05	12.00	12.50	3.00	

Total time
Rate per hour 40¢
Total wages

4.

WEEK ENDING FEB. 13, 1915.
Name W. H. STEVENS

DAY	MORNING		AFTERNOON		TOTAL HOURS
	IN	OUT	IN	OUT	
Mon.	8.00	12.01	1.00	4.02	
Tue.	7.55	12.04	12.50	4.06	
Wed.	8.00	11.23	12.56	4.00	
Thu.	8.00	10.45	12.58	4.02	
Fri.	7.49	12.05	12.52	4.07	
Sat.	7.54	12.12	12.51	4.10	

Total time
Rate per hour 48¢
Total wages

5.

WEEK ENDING FEB. 26, 1916.
Name H. T. BAKER

Day	Morning In	Morning Out	Afternoon In	Afternoon Out	Total Hours
Mon.	7.52	12.02	12.40	5.10	
Tue.	8.05	12.01	1.00	5.08	
Wed.	9.20	12.10	1.00	5.02	
Thu.	8.00	12.06	1.00	5.04	
Fri.	7.56	12.05	12.50	5.01	
Sat.	7.59	11.23	12.56	5.04	

Total time
Rate per hour $37\frac{1}{2}$¢
Total wages

6.

WEEK ENDING FEB. 26, 1916.
Name H. O. HUDSON

Day	Morning In	Morning Out	Afternoon In	Afternoon Out	Total Hours
Mon.	8.05	12.01	12.58	5.06	
Tue.	7.50	12.02	1.00	5.01	
Wed.	8.05	12.01	1.00	5.06	
Thu.	9.04	12.01	12.56	5.02	
Fri.	7.49	12.10	1.00	2.20	
Sat.	7.50	12.01	12.56	2.13	

Total time
Rate per hour 45¢
Total wages

7.

WEEK ENDING FEB. 26, 1916.
Name SAMUEL ROBERTS

Day	Morning In	Morning Out	Afternoon In	Afternoon Out	Total Hours
Mon.	7.54	12.06	12.41	5.04	
Tue.	8.00	12.01	12.45	5.01	
Wed.	7.50	12.01	12.49	5.06	
Thu.	8.13	12.05	1.00	5.03	
Fri.	9.05	12.10	1.10	5.03	
Sat.	7.59	12.06	1.00	4.00	

Total time
Rate per hour 32¢
Total wages

8.

WEEK ENDING FEB. 26, 1916.
Name M. O. BROWN

Day	Morning In	Morning Out	Afternoon In	Afternoon Out	Total Hours
Mon.	8.07	12.01	1.00	5.02	
Tue.	7.51	11.40	1.00	5.05	
Wed.	7.46	12.02	12.56	5.04	
Thu.	7.50	11.06	12.57	5.01	
Fri.	7.51	12.02	12.58	3.12	
Sat.	7.58	12.04	12.50	3.08	

Total time
Rate per hour 60¢
Total wages

FACTORY WAGES

In the cutting room of a shoe factory the men are paid by the day.

The following schedule of cutting-room wages was agreed upon by the officials of the Labor Union and a shoe manufacturer. Find out as much as you can about the different processes mentioned.

Find how much each of the following jobs are worth per hour:

	Name of Job	Wages per Day of Eight Hours	Wages per Hour
1.	Cutting vamps	$3.25	?
2.	Top cutting by hand	2.75	?
3.	Clicking machine on outsides	3.75	?
4.	Crimping	2.45	?
5.	Marking linings	2.35	?
6.	Dieing out on block	2.25	?

Compute the wages of each of the following men for the time specified:

7. W. S. Brown, vamp cutter, who works 7 hr., on Monday.

8. L. R. Condon, top cutter, who works 8 hr., on Monday.

9. O. B. Downey, operating clicking machine, $4\frac{1}{2}$ hr.

10. A. R. Eames, crimper, $7\frac{1}{4}$ hr., on Tuesday.

11. B. C. Hudson, marking linings, entire week.

12. A. B. Jones, dieing on block, a week of 32 hr.

13. Compare the wages of outdoor workers on p. 204 with the above factory wages. State reasons for the difference.

14. What is the hourly wage of a stone mason at $4.50 a day of 8 hr.? What are a full week's wages?

Wages per Day of Eight Hours	
Carpenters, $4.00	Plasterers, $5.00
Stone masons, $4.50	Plasterer's helpers, $3.00
Brick masons, $4.80	Lathers, $4.50
Hod carriers, $2.40	Tile setters, $4.80

THE PAY ROLL

The following pay roll is made out from time cards similar to those on page 201, and the money necessary to pay for the work done is drawn from the National Bank. Each employee receives a pay envelope containing the exact amount of his wage; consequently the paymaster must obtain his money in suitable denominations to give each the exact amount due him.

Fill in the weekly pay of each man and the bills and coins necessary to pay him exactly. (See items in the first line.)

A Pay Roll Form

	Name	Total Number of Hours	Wages per Hour	Total Amount	Denominations								
					$10	5	2	1	.50	.25	.10	.05	.01
1.	Adams, Wm.	47½	$.27	$12.83*	1		1		1	1		1	3
2.	Alcott, E.	48	.22½	?	?	?	?	?	?	?	?	?	?
3.	Bacon, Y.	46¾	.32	?	?	?	?	?	?	?	?	?	?
4.	Bolster, R.	48	.24	?	?	?	?	?	?	?	?	?	?
5.	Frost, Wm.	45¼	.40	?	?	?	?	?	?	?	?	?	?
6.	Hooker, H.	40	.24½	?	?	?	?	?	?	?	?	?	?
7.	Lee, Thos.	47½	.28	?	?	?	?	?	?	?	?	?	?
8.	Melrose, Z.	46	.33⅓	?	?	?	?	?	?	?	?	?	?
9.	Thomas, F.	42¾	.28	?	?	?	?	?	?	?	?	?	?
10.	Total number of each bill and coin				?	?	?	?	?	?	?	?	?

* Count 5 mills or over as 1 cent, and discard under 5 mills.

The clerks in the Paymaster's Department collect the time cards and copy the daily records in some such form as follows.

Copy the names from the following pay rolls and rule columns for the "Total Number of Hours" and the "Week's Pay." Fill in both columns from the facts recorded in the table:

PAY ROLL OF
CONSOLIDATED BOOT AND SHOE COMPANY

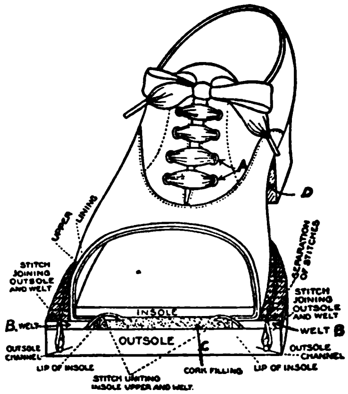
ROOM — Cutting Department WEEK — January 3d to 8th, 1916

	NAMES OF EMPLOYEES	MON.	TUE.	WED.	THU.	FRI.	SAT.	TOTAL NO. HOURS	WAGE PER HOUR	WEEK'S PAY
1.	Ames, A.	8 hr.	8 hr.	7½ hr.	8 hr.	8 hr.	3½ hr.	?	30 ¢	?
2.	Brown, S.	7½ hr.	8 hr.	8 hr.	5½ hr.	7½ hr.	8 hr.	?	25 ¢	?
3.	Cannon, O.	5 hr.	4 hr.	6½ hr.	5½ hr.	7 hr.	3½ hr.	?	22 ¢	?
4.	Downe, M.	8 hr.	8 hr.	8 hr.	8 hr.	8 hr.	5 hr.	?	30 ¢	?
5.	Frost, W.	8 hr.	7½ hr.	7¾ hr.	8 hr.	7½ hr.	6½ hr.	?	41 ¢	?
6.	Holmes, J.	8 hr.	8 hr.	7 hr.	7 hr.	3 hr.	3 hr.	?	38 ¢	?
7.	Lane, R.	8 hr.	8 hr.	7¾ hr.	8 hr.	8 hr.	4½ hr.	?	33 ¢	?

PAY ROLL OF
CONTINENTAL MANUFACTURING COMPANY

	NAME	MON.	TUE.	WED.	THU.	FRI.	SAT.	TOTAL NO. HOURS	WAGE PER HOUR	WEEK'S PAY
8.	Bacon, A.	6 hr.	8 hr.	8 hr.	8 hr.	8 hr.	5 hr.		41 ¢	
9.	Barnes, H.	7¼ hr.	8 hr.	8 hr.	8 hr.	5¾ hr.	5 hr.		50 ¢	
10.	Bevis, W.	8 hr.	8 hr.	8 hr.	8 hr.	8 hr.	4 hr.		37 ¢	
11.	Billings, R.	8 hr.	8 hr.	8 hr.	8 hr.	8 hr.	5 hr.		37 ¢	
12.	Boone, D.	5 hr.	8 hr.	8 hr.	8 hr.	8 hr.	5 hr.		36 ¢	
13.	Burns, H.	8 hr.	8 hr.	8 hr.	8 hr.	8 hr.	7¾ hr.		30 ¢	
14.	Burrill, R.	8 hr.	8 hr.	7 hr.	7 hr.	7 hr.	7 hr.		44½ ¢	

WORKING BY THE PIECE



In a shoe factory many workers receive wages according to the amount of work done. They are said to work by the piece.

A PIECE SCALE OF WAGES

(*a*)	Eyeletting (See *A* in diagram)	\$.01½	per doz. pair.
(*b*)	Trimming toes	.01½	per doz. pair.
(*c*)	Welting (See *B*)	.15	per doz. pair.
(*d*)	Trimming inner seams	.03½	per doz. pair.
(*e*)	Filling bottoms (See *C*)	.02	per doz. pair.
(*f*)	Rough rounding	.18	per doz. pair.
(*g*)	Cementing bottoms	.01½	per doz. pair.
(*h*)	Leveling bottoms	.05	per doz. pair.
(*i*)	Trimming edges	.25	per doz. pair.
(*j*)	Breasting heels (See *D*)	.03	per doz. pair.
(*k*)	Burnishing heels	.06	per doz. pair.

Compute the wage for one day for each of the following operatives at the price indicated in the preceding wage scale:

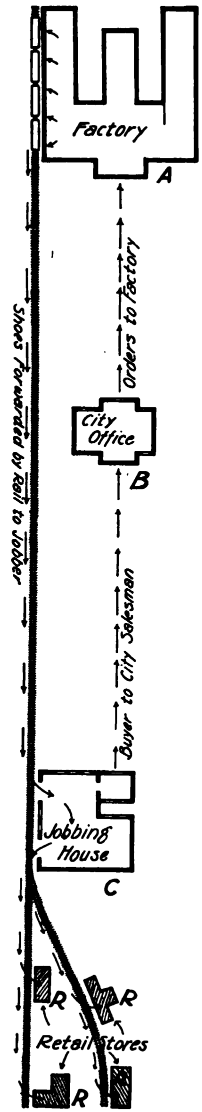
	Name of Job	Day's Work
1.	Eyeletting	150 doz.
2.	Toe trimming	160 doz.
3.	Welting	23 doz.
4.	Trimming seams	102 doz.
5.	Filling bottoms	132 doz.
6.	Rough rounding	21 doz.

	Name of Job	Day's Work
7.	Cementing bottoms	180 doz.
8.	Leveling bottoms	43 doz.
9.	Trimming edges	15 doz.
10.	Breasting heels	83 doz.
11.	Burnishing heels	43 doz.

Computing the Week's Wages. — Each line in the following table represents the work done by a man or a woman in one week. It is mostly machine work and the amount which can be earned in a week depends on the quickness of eye and hand and the industry of the operative. He receives his pay for actual work done, not for time spent.

Find how much each should be paid for the week's work:

	Name of Job	Number of Dozen per Day					
		Mon.	Tue.	Wed.	Thu.	Fri.	Sat.
12.	Eyeletting	98	112	115	118	116	75
13.	Toe trimming	150	148	157	160	155	86
14.	Welting	18	21	19	23	27	12
15.	Trimming inner seams	75	78	81	79	80	52
16.	Filling bottoms	125	130	128	131	135	80
17.	Rough rounding	17	18	21	19	18	10
18.	Cementing bottoms	175	181	173	176	182	90
19.	Leveling bottoms	45	48	51	45	47	30
20.	Trimming edges	14	15	15	16	13	8
21.	Breasting heels	86	79	81	73	80	51
22.	Burnishing heels	45	48	50	49	51	28



BUYING AND SELLING SHOES

(Have the class become thoroughly familiar with the process described below.)

The diagram at the left will help the class to understand the main steps in getting a pair of shoes from the factory where they are made to the man or the woman who wears them.

The manufacturer who operates the factory (*A*) hires an agent who maintains an office (*B*) in some near-by city. It is this agent's business to take orders from the wholesale shoe dealers, who are called jobbers or jobbing houses (*C*). These jobbing houses send buyers to the city office (*B*), who look over the samples of the selling agent at (*B*) and give the agent an order for the shoes they will need for the next season. ***B*** sends these orders to the factory, and they are made up in due time and shipped from the factory via the railroad to the jobbing house (*C*).

Meanwhile, agents from the jobbing house have been visiting the retail dealers (***R***, ***R***, ***R***, ***R***) in surrounding small towns and have taken orders from them. When the goods arrive at the jobber's warerooms, they are shipped in smaller amounts to the retail stores.

You will readily see that the above process requires many buying and selling agents. These are excellent positions for bright, energetic, and honest young men; while the offices of factory and jobbing house require the services of many quick and accurate employees.

Some of the arithmetic of the shoe business will be found in the following problems:

The selling agent for a large slipper factory in Lynn, Mass., has an office in the boot and shoe district of Boston. On May 2, 1916, he shows his line of samples to a buyer from Horne & Cleave, jobbers in Chicago. A part of the order given to the slipper salesman follows:

JOBBER'S ORDER

CHICAGO, ILL., May 2, 1916

CONSOLIDATED SLIPPER CO.,
LYNN, MASS.

Please ship us by Sept. 1, 1916
Subject to discount of 8% if paid by Oct. 1, 1916

ITEM NUMBER	STYLE NUMBER	NUMBER OF CASES	PAIRS IN CASE	SIZES DESIRED				PRICE PER PAIR	TOTAL CHARGE
1.	5732	15	36	3 c. 3–8	2 c. 3½–8½	8 c. 4–8	2 c. 4–5½	$.57½	?
2.	2180	5	36	2 c. 5–6	1 c. 7–8	1 c. 2–8	1 c. 4½–8½	.65	?
3.	4165	3	60	1 c. 3–7	1 c. 6½–8	1 c. 1–4½		.87	?

EXPLANATION. — The first item calls for 15 cases, each case to contain 36 pair of slippers made in style which is numbered 5732 in the factory catalogue. Three cases are to run from size 3 to size 8; 2 cases to be half sizes running from 3½ to 8½, etc. For each pair of shoes the jobber agrees to pay $.57½.

1. (*a*) Compute the total cost of order item No. 1.
   (*b*) Compute the total cost of order item No. 2.
   (*c*) Compute the total cost of order item No. 3.
   (*d*) Compute the total cost of the three items.
   (*e*) Deduct the discount for prompt payment. (See bill.)

2. On the following day the same selling agent receives an order from a jobbing house in Los Angeles, Cal., and transmits it to his factory. Read each line in the following order, explaining what the different items mean. Which of the facts are used in determining the cost to the buyer?

ORDER NO. 95 BOSTON, MASS., MAY 3, 1916

CONSOLIDATED SLIPPER CO.,
LYNN, MASS.

SOLD BY *Wm. H. Townsend* SHIP TO *Golden State Shoe Co., Los Angeles, Cal.*
VIA *So. Pacific R.R.*
When ship. *Nov. 1, 1916* Terms: *7 % discount if paid in 10 days*

STOCK No.	NO. CASES	PAIRS IN CASE	UPPERS	KIND	TRIMMING	SOLE	FINISH	SIZES	PRICE	TOTAL
58	2	36	L. Gray	Princess	Satin	Flex	Velvet	3–7	$.57	?
295	1	60	Wool	Juliette High Heel	Fur	Flex	Gilt Buckle Satin Bow	4–8	$1.22	?
461	2	36	Wool Felt	Agnes	Fur	Flex	Ribbon Tie	2½–7	$.98	?

Compute the following:

(*a*) Total amount of first kind.
(*b*) Total amount of second kind.
(*c*) Total amount of third kind.
(*d*) Total amount of all.
(*e*) Net cost to jobber if paid within 10 days.
(*f*) Commission due the salesman at 2½ %.

3. Edward R. Brooks, shoe salesman, took orders during the month as follows:

May 5, $250.00	May 16, $ 40.75	May 25, $217.40
May 8, 167.50	May 19, 238.64	May 26, 26.84
May 11, 84.50	May 22, 461.42	May 27, 196.53
May 13, 341.90	May 23, 500.00	May 30, 500.00

Find the total amount of his sales for the month.

4. Find how much his commission amounts to at $2\frac{1}{2}\%$.

5. What is the salesman's commission on the following sales at 3%?

4 — 60-pair cases at $1.17 per pair.
3 — 36-pair cases at .89 per pair.
15 — 24-pair cases at 1.70 per pair.
5 — 60-pair cases at .92 per pair.
8 — 36-pair cases at 1.12 per pair.

6. At 2% commission, how much does a salesman earn on the following sales?

6 — 24-pair cases at $ .67½ per pair.
4 — 36-pair cases at .78½ per pair.
13 — 24-pair cases at 1.15 per pair.
14 — 36-pair cases at 1.60 per pair.
7 — 60-pair cases at 1.07 per pair.

7. At $2\frac{1}{2}\%$ commission, how much does an agent earn on the following sales?

5 — 24-pair cases at $ .69 per pair.
3 — 36-pair cases at .92 per pair.
11 — 24-pair cases at 1.08 per pair.
4 — 36-pair cases at 1.72 per pair.
3 — 24-pair cases at 1.37½ per pair.

Factors in the Cost of Shoes

The buyer of boots and shoes seldom realizes that a considerable part of the cost of a pair of shoes is caused by the process of **distribution**. Not only must shoes pass through several hundred pairs of hands in the factory, but they are later handled by freight handlers, expressmen, and jobbing houses; they are ordered, recorded, billed, etc., by selling agents, buying agents, clerks, and bookkeepers. All these people are necessary to the transportation, distribution, and sale of shoes; all of them must be paid, and the pay must finally come from the men, women, and children who wear the shoes.

The following table shows the effect of such distribution on consecutive prices of slippers and shoes:

Kind of Shoe	Manufacturer's Price to the Jobber	Jobber's Price to the Retailer	Retailer's Price to the Customer
Woman's cheap slipper	\$ .57½	\$ .65	\$ .80
Woman's felt slipper	.67½	.75	1.00
Baby's slipper	.25	.27½	.35
Man's lounging slipper	.70	.82½	1.25
Ladies' dongola	1.40	1.60	2.25
Ladies' patent leather slipper	1.10	1.25	1.75

1. Compute the jobber's gain on one 60-pair case of each kind of slippers listed above.

2. Compute the retail dealer's gain on one 24-pair case of each pair of the above slippers which he purchased of the jobber.

3. The jobber's price is what per cent higher than the manufacturer's price for the last two styles?

4. The retail dealer's price is what per cent higher than the jobber's price for the first two?

POSTAL PROBLEMS

MONEY ORDERS

Ioney may be sent, at a very low cost, and with no risk, to all parts of the ;ed States and to foreign countries, by means of postal money orders. se are issued for any sum up to $100, and additional orders can be made if a person desires to send more than $100.

n money orders sent to any part of the United States or Canada or ny of the island possessions of the United States, the following fees are ged:

For orders from $ 0.01 to $ 2.50	3 cents.
For orders from $ 2.51 to $ 5.00	5 cents.
For orders from $ 5.01 to $ 10.00	8 cents.
For orders from $10.01 to $ 20.00	10 cents.
For orders from $20.01 to $ 30.00	12 cents.
For orders from $30.01 to $ 40.00	15 cents.
For orders from $40.01 to $ 50.00	18 cents.
For orders from $50.01 to $ 60.00	20 cents.
For orders from $60.01 to $ 75.00	25 cents.
For orders from $75.01 to $100.00	30 cents.

Oral or Written Exercise

. How much will it cost to obtain a money order for $15 to sent to San Francisco?

$15.00 + $.10 = $15.10.

'opy and fill out the following:

	Amount of Money Order	Charge	Amount Paid	Change
.	$ 2.75	?	$ 3.00	?
.	8.23	?	9.00	?
.	10.17	?	12.00	?
.	14.05	?	15.00	?
.	17.60	?	20.00	?
.	21.50	?	22.00	?
.	26.75	?	27.00	?

STAMPS AND STAMPED ENVELOPES

Number	Stamped and Printed (2¢) Envelopes $3\frac{1}{2}'' \times 6\frac{5}{16}''$	Stamped Unprinted (2¢) Envelopes $3\frac{1}{2}'' \times 6\frac{5}{16}''$	Stamped (1¢) Newspaper Wrappers $8'' \times 12''$	Stamp Books Containing
1000	$ 21.12	$ 21.00	$ 10.72	24 1¢ stamps **25¢**
500	10.62	10.50	5.36	
250	5.31	5.25	2.68	
100	2.13	2.10	1.08	
50	1.07	1.05	.54	96 1¢ stamps **97¢**
25	.54	.53	.27	
24	.51	.51	.26	
23	.49	.49	.25	
22	.47	.47	.24	
21	.45	.45	.23	12 2¢ stamps **25¢**
20	.43	.42	.22	
19	.41	.40	.21	
18	.39	.38	.20	
17	.37	.36	.19	
16	.34	.34	.18	24 2¢ stamps **49¢**
15	.32	.32	.17	
14	.30	.30	.16	
13	.28	.28	.14	
12	.26	.26	.13	48 2¢ stamps **97¢**
11	.24	.24	.12	
10	.22	.21	.11	
9	.20	.19	.10	
8	.17	.17	.09	
7	.15	.15	.08	
6	.13	.13	.07	
5	.11	.11	.06	
4	.09	.09	.05	
3	.07	.07	.04	
2	.05	.05	.03	
1	.03	.03	.02	

Oral Exercise

Ascertain the charge on each of the following purchases by referring to the price list on the preceding page, and specify the coins to be given in making change. Follow the plan used on page 5. Do it mentally.

	Purchase	Money Presented by Customer
1.	500 Printed envelopes $3\frac{1}{2}'' \times 6\frac{5}{16}''$	$15.00
2.	250 Unprinted envelopes	6.00
3.	100 Printed envelopes	2.50
4.	100 Newspaper wrappers	2.00
5.	100 Wrappers and a book of 24 1-cent stamps	2.00
6.	50 Printed envelopes	2.00
7.	25 Wrappers and a book of 24 1-cent stamps	1.00
8.	24 Unprinted envelopes and a 97-cent book	2.00
9.	25 Unprinted envelopes and 25 wrappers	1.00
10.	20 Printed and 20 unprinted envelopes	5.00
11.	20 Wrappers and a book of 24 2-cent stamps	1.00
12.	18 Printed envelopes and 2 5-cent stamps	2.00
13.	16 Unprinted envelopes and 3 wrappers	.50
14.	14 Printed envelopes and a book of 48 2-cent stamps	1.50
15.	12 Printed envelopes and 2 books of 24 1-cent stamps	1.00
16.	10 Printed envelopes and 6 wrappers	.50
17.	9 Unprinted envelopes and a book of 24 2-cent stamps	.75
18.	2 Books of 96 1-cent stamps	2.00
19.	1 Book of 96 1-cent stamps and 1 of 12 2-cent stamps	1.50
20.	4 Printed and 1000 unprinted envelopes	22.00
21.	100 Printed envelopes and 3 wrappers	3.00
22.	50 Printed and 50 unprinted envelopes	3.00
23.	A book of 48 2-cent stamps and 50 wrappers	2.00
24.	1000 wrappers and 1 printed envelope	15.00

PARCEL POST

Scale Arm *Sliding Weight*

1	2	3	4	5	6	7	8	9	10	11	12	13	POUNDS
05	06	06	07	07	08	08	09	09	10	10	11	11	LOCAL
05	06	07	08	09	10	11	12	13	14	15	16	17	1ST. ZONE
05	06	07	08	09	10	11	12	13	14	15	16	17	2ND. "
06	08	10	12	14	16	18	20	22	24	26	28	30	3RD. "
07	11	15	19	23	27	31	35	39	43	47	51	55	4 TH. "
08	14	20	26	32	38	44	50	56	62	68	74	80	5 TH. "
09	17	25	33	41	49	57	65	73	81	89	97	1.05	6 TH. "
11	21	31	41	51	61	71	81	91	1.01	1.11	1.21	1.31	7 TH "
12	24	36	48	60	72	84	96	1.08	1.20	1.32	1.44	1.56	8 TH "

Bundles containing merchandise, such as factory products, seeds, bulbs, plants, books, etc., may be sent to any part of the United States or its possessions by parcel post.

The cost depends on the **weight** and the **distance**, and may be found by weighing the parcel and referring to a table like that on the following page.

The **local rate** is applied to any parcel intended for delivery at the post office where it is mailed or at any point on a rural route starting therefrom.

The combined length and girth may not be over 84 in. The weight may not exceed 50 lb. in 1st and 2d zones; nor 20 lb. in other zones.

If a bundle weighs 7 lb. and 1 oz., it is considered in the 8-pound class. For the 3d zone, the charge is 20 cents.

A bundle weighing 3 lb. 4 oz. goes as a 4-pound bundle. For the 5th zone, the charge is 26 cents.

TABLE OF PARCEL POST CHARGES

Weight in Pounds	Local	ZONES 1st Up to 50 miles	2d 50 to 150 miles	3d 150 to 300 miles	4th 300 to 600 miles	5th 600 to 1000 miles	6th 1000 to 1400 miles	7th 1400 to 1800 miles	8th Over 1800 miles
1	$0.05	$0.05	$0.05	$0.06	$0.07	$0.08	$0.09	$0.11	$0.12
2	.06	.06	.06	.08	.11	.14	.17	.21	.24
3	.06	.07	.07	.10	.15	.20	.25	.31	.36
4	.07	.08	.08	.12	.19	.26	.33	.41	.48
5	.07	.09	.09	.14	.23	.32	.41	.51	.60
6	.08	.10	.10	.16	.27	.38	.49	.61	.72
7	.08	.11	.11	.18	.31	.44	.57	.71	.84
8	.09	.12	.12	.20	.35	.50	.65	.81	.96
9	.09	.13	.13	.22	.39	.56	.73	.91	1.08
10	.10	.14	.14	.24	.43	.62	.81	1.01	1.20
11	.10	.15	.15	.26	.47	.68	.89	1.11	1.32
12	.11	.16	.16	.28	.51	.74	.97	1.21	1.44
13	.11	.17	.17	.30	.55	.80	1.05	1.31	1.56
14	.12	.18	.18	.32	.59	.86	1.13	1.41	1.68
15	.12	.19	.19	.34	.63	.92	1.21	1.51	1.80
16	.13	.20	.20	.36	.67	.98	1.29	1.61	1.92
17	.13	.21	.21	.38	.71	1.04	1.37	1.71	2.04
18	.14	.22	.22	.40	.75	1.10	1.45	1.81	2.16
19	.14	.23	.23	.42	.79	1.16	1.53	1.91	2.28
20	.15	.24	.24	.44	.83	1.22	1.61	2.01	2.40

Compute the charge on each of the following parcels:

1. Weight 3 lb. 6 oz. for 3d zone.
2. Weight 14 lb. 1 oz., local.
3. Weight 5 lb. 3 oz. for 2d zone.
4. Weight 1 lb. 8 oz. for 8th zone.
5. Weight 7 lb. 5 oz. for 6th zone.
6. Weight 18 lb. 9 oz. for 1st zone.
7. Weight 15 lb. 2 oz., local.
8. Weight 11 lb. 13 oz. for 5th zone.
9. Weight 20 lb. for 2d zone.

SAVING AND INVESTING MONEY

NATIONAL BANKS

All business men have on hand, from time to time, comparatively large sums of money. Men who receive a monthly salary also may have more cash at certain times in the month than they wish to carry about with them. A **national bank** receives such accumulations of surplus cash and keeps them in safety.

When the business man wishes to pay his employees, he may withdraw his money by calling at the bank or sending a representative. For ordinary payment of debts, however, the depositor writes a check and gives or mails it to the person to whom he owes money. This check is sooner or later presented at the bank, and the amount named on it is deducted from the depositor's account.

The business man keeps large sums on deposit and adds to them from the surplus in his cash box several times a week.

All deposits are added to the balance already in the bank.

1. W. R. Johnson conducts a large market. He deposited this morning $25.00 in silver, $250.00 in bills, and five checks received from his customers. He made out the deposit slip on the next page and gave it to the cashier, who added the total amount to his previous balance, which was $795.60.

(*a*) What was the total amount of his deposit?

(*b*) To what sum did this bring his daily balance?

2. Make out the slip for the next depositor, E. E. Towne, who deposited $8.50 in silver, $135.00 in bills, and checks for $5.72, $4.90, $8.37, $9.64.

3. The third depositor, R. A. Babcock, deposited $17.50 in silver, $156.00 in bills, and checks for $97.00, $14.91, and $5.23. Make out his slip.

4. The fourth, H. R. Breck, deposited $170.00 in bills, and checks for the following amounts: $1.80, $5.60, $14.30, and $18.00. Make out his deposit slip.

5. Mr. H. H. Howes deposited for the company of Howes and Sampson the following: silver, $15.00, bills, $160.00, checks, $12.50, $8.70, $1.30, $15.50, $20.75, $13.00. Make out the deposit slip, remembering that the deposit is on the account of the company.

DEPOSIT SLIP

Home National Bank
OXFORD, MASS.

DEPOSITED BY

William R. Johnson

Date *July 19,* 19*15*

Gold		
Silver	*$ 25*	*00*
Bills	*250*	*00*
Checks	*7*	*40*
	5	*80*
	9	*70*
	21	*00*
	1	*53*
	?	*?*

6. Holmes and Brown deposited $41.00 in silver, $265.00 in bills, and checks for the following amounts: $50.00, $1.85, $14.28, $15.50. Make out the deposit slip.

CHECKS

$ *28 00* Brockton, Mass. *Jan 21,* 191*4*

Home National Bank of Brockton 53-148

PAY TO THE ORDER OF *J. H. White*

Twenty eight no/100 Dollars.

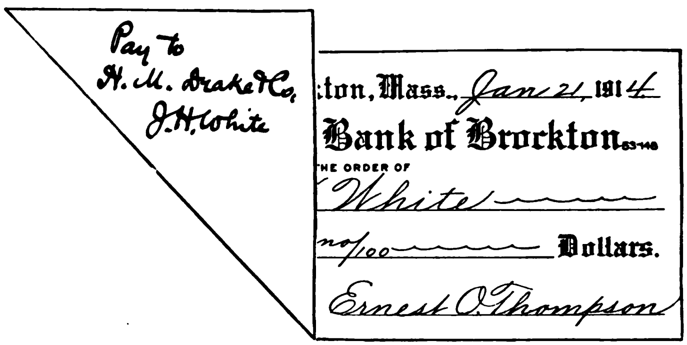
No. *1* PAYABLE AT THE NATIONAL SHAWMUT BANK BOSTON, MASS. THROUGH CLEARING HOUSE *Ernest O. Thompson*

STUB

No. 41
Date 1/21/'14
To J. H. White
For rent
Amount, $28

Ernest O. Thompson has $500 in the Home National Bank. He pays his rent each month by a check like that at the bottom of page 219. When he writes the check, he may also fill in the blank spaces in the "stub"* (a piece attached to the end of the check for memoranda), so that he can recall for what he paid the $28. He detaches the check, tearing along the dotted line, and gives it to Mr. White. His landlord, Mr. White, may take the check to the Home National Bank where the amount, $28, will be paid him by the cashier, and that amount will be deducted from the $500 which Ernest O. Thompson has in the bank.

Instead of taking the check to the bank, Mr. White may use it in paying his own grocery bill. The check, as on page 219, is made payable to him. To make it payable to the grocer, H. M. Drake & Co., he turns the check over and **indorses** it on the back as follows:



* Some check books have blank sheets for memoranda in place of stubs.

Paying Bills by Check

1. E. S. Burns, boot and shoe salesman, took orders for the A. B. Armstrong Co. amounting to $8000 during July. The Company paid him his commission of 2%, filling in a blank check like the following. Complete the check.

*No.*__________ CHICAGO, ILL.,__________*19*___.

FIRST NATIONAL BANK, CHICAGO, ILL.

*Pay to the order of*______________________________

____*Dollars*

*$*________ ________________________

2. At the left-hand side of your paper, rule money columns like those on the following bill; fill in the amount of each item and compute the total amount of the bill. Then make out a check for the bill:

BOSTON, MASS., June 5, 1915

*Mr.*________________________

Pemaquid Point, Maine

To COBB, BATES, AND YERXA COMPANY *Dr.*

5 pkg. Grape Nuts	.13				
15 lb. Franklin Mills Flour	.05				
12 lb. Granulated Yellow Meal	.03				
8 lb. California Prunes	.16				
12 lb. Victoria Seeded Raisins	.12				
10 cans Oneida Canned Tomatoes	.16				
8 cans Honey Drop Canned Corn	.14				
5 cans Sifted Early June Peas	.25				
3 cans Mushrooms	.28				
6 jars Orange Marmalade	.25				
2 doz. Eagle Condensed Milk	1.65				
Freight			65		

NATIONAL BANK ACCOUNTS

A simple form of keeping account of the amount which the depositor has to his credit in the national bank is shown below. It must be remembered that:

Every deposit is added to the balance.

Every check drawn is subtracted from the balance.

1. Explain how each amount in the following account was obtained:

EDWARD R. SPENCER'S ACCOUNT WITH
HOME NATIONAL BANK

Balance Apr. 1		460	00
Deposited Apr. 1		50	
		510	00
Checks	50.00		
	7.40		
	10.70		
	68.10	68	10
		441	90
Deposited Apr. 5		75	
		516	90
Checks	21.60		
	15.37		
	36.97	36	97
		479	93
Deposited Apr. 10		124	00
		603	93
Checks	4.60		
	9.85		
	1.32		
	8.71		
	14.60		
	39.08	39	08
		564	85

Oral Exercise

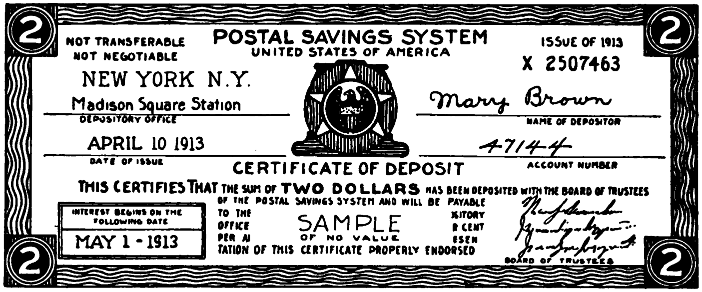
Ascertain the charge on each of the following purchases by referring to the price list on the preceding page, and specify the coins to be given in making change. Follow the plan used on page 5. Do it mentally.

	Purchase	Money Presented by Customer
1.	500 Printed envelopes $3\frac{1}{2}'' \times 6\frac{5}{16}''$	$15.00
2.	250 Unprinted envelopes	6.00
3.	100 Printed envelopes	2.50
4.	100 Newspaper wrappers	2.00
5.	100 Wrappers and a book of 24 1-cent stamps	2.00
6.	50 Printed envelopes	2.00
7.	25 Wrappers and a book of 24 1-cent stamps	1.00
8.	24 Unprinted envelopes and a 97-cent book	2.00
9.	25 Unprinted envelopes and 25 wrappers	1.00
10.	20 Printed and 20 unprinted envelopes	5.00
11.	20 Wrappers and a book of 24 2-cent stamps	1.00
12.	18 Printed envelopes and 2 5-cent stamps	2.00
13.	16 Unprinted envelopes and 3 wrappers	.50
14.	14 Printed envelopes and a book of 48 2-cent stamps	1.50
15.	12 Printed envelopes and 2 books of 24 1-cent stamps	1.00
16.	10 Printed envelopes and 6 wrappers	.50
17.	9 Unprinted envelopes and a book of 24 2-cent stamps	.75
18.	2 Books of 96 1-cent stamps	2.00
19.	1 Book of 96 1-cent stamps and 1 of 12 2-cent stamps	1.50
20.	4 Printed and 1000 unprinted envelopes	22.00
21.	100 Printed envelopes and 3 wrappers	3.00
22.	50 Printed and 50 unprinted envelopes	3.00
23.	A book of 48 2-cent stamps and 50 wrappers	2.00
24.	1000 wrappers and 1 printed envelope	15.00

THE POSTAL SAVINGS SYSTEM

Any person over ten years old may open an account and deposit any number of dollars from $1 to $100 at any post office in the United States. This system establishes a government savings bank in every post office. The postmaster or a clerk will fill out a certificate like the following for $1, $2, $5, $10, $20, $50, or $100.

NOTE. — The limit accepted is $100 for any month and $500 all together. No account is opened for less than $1, but amounts less than $1 may be saved for deposit by purchasing 10-cent **postal savings cards** and 10-cent **postal savings stamps**. A card with nine stamps affixed is accepted as a deposit of $1.



As a *separate certificate* is given when each deposit is made, a depositor has as many certificates as he has made deposits.

Interest at 2 % is paid yearly on each deposit. No interest is paid for fractional parts of a year. Each deposit begins to draw interest on the first day of the month following the deposit.

1. Find the interest for 1 yr. on $5 deposited Sept. 15, 1915.

$5 deposited Sept. 15, 1915, draws interest from Oct. 1, 1915, and entitles the depositor to 2 % interest Oct. 1, 1916.

2 % of $5 = $.10, interest for 1 yr.

2. A boy makes the following deposits in November, 1915. How much interest is due Dec. 1, 1916? Nov. 5, \$2; Nov. 13, \$3; Nov. 27, \$5. The total amount begins to draw interest Dec. 1. If it is left in until Dec. 1 of the following year, the boy receives 2% interest.

2% of \$10 = \$.20.

3. Copy the following and fill in the blank columns:

Amount of Deposit	Date of Deposit	Date when Interest Begins	Date on which Interest becomes Due	Amount of Interest
\$ 1.00	Sept. 6, 1915	?	?	?
\$ 5.00	Sept. 30, 1915			
\$ 6.00	Oct. 5, 1915			
\$15.00	Oct. 16, 1915			
\$ 7.00	Oct. 28, 1915			
\$12.00	Nov. 13, 1915			
\$ 3.00	Nov. 17, 1915			
\$ 8.00	Dec. 3, 1915			
\$11.00	Dec. 14, 1915			
\$17.00	Dec. 27, 1915			
\$20.00	Jan. 3, 1916			
\$24.00	Jan. 12, 1916			
\$14.00	Feb. 7, 1916			
\$19.00	Feb. 9, 1916			
\$ 9.00	Feb. 17, 1916			
\$ 4.00	Feb. 24, 1916			
\$22.00	Feb. 28, 1916			
\$35.00	Mar. 4, 1916			
\$31.00	Mar. 9, 1916			
\$10.00	Mar. 18, 1916			
\$13.00	Mar. 23, 1916			
\$16.00	Mar. 31, 1916			
\$21.00	Apr. 3, 1916			
\$40.00	Apr. 8, 1916			
\$22.00	Apr. 20, 1916			
\$30.00	Apr. 24, 1916			
\$18.00	Apr. 28, 1916			
\$25.00	May 8, 1916			

BRIEF REVIEW OF INTEREST *

1. Find the interest on \$500 for 1 yr. at 6 %.

The principal is	\$500
1 % of the principal is	5
6 % of the principal is	30, the interest.

Find the interest *for one year* on the following principals at the rates indicated:

2. \$230 at 5 %.

3. \$380 at 4 %.

4. \$275 at 3 %.

5. \$132 at 6 %.

6. \$325 at 5 %.

7. \$240 at $4\frac{1}{2}$ %.

8. \$275 at $3\frac{1}{3}$ %.

9. \$460 at $5\frac{1}{2}$ %.

10. \$526 at $3\frac{1}{2}$ %.

11. \$232 at $5\frac{1}{2}$ %.

To find the interest for some commonly used *parts of a year*, observe the following facts:

Interest at 6 % for	Interest at 4 % for	Interest at 3 % for
6 mo. = 3 %	6 mo. = 2 %	4 mo. = 1 %
4 mo. = 2 %	3 mo. = 1 %	2 mo. = $\frac{1}{2}$ %
8 mo. = 4 %	9 mo. = 3 %	8 mo. = 2 %
2 mo. = 1 %		
of the principal.	of the principal.	of the principal.

Find the interest on the following:

12. \$ 150 at 6 % for 6 mo.

13. \$ 560 at 4 % for 6 mo.

14. \$ 581 at 3 % for 4 mo.

15. \$ 284 at 3 % for 2 mo.

16. \$ 950 at 4 % for 9 mo.

17. \$ 290 at 3 % for 8 mo.

18. \$ 875 at 4 % for 3 mo.

19. \$ 791 at 4 % for 9 mo.

20. \$420 at 4 % for 6 mo.

21. \$530 at 4 % for 3 mo.

22. \$270 at 6 % for 4 mo.

23. \$888 at 6 % for 8 mo.

24. \$190 at 4 % for 3 mo.

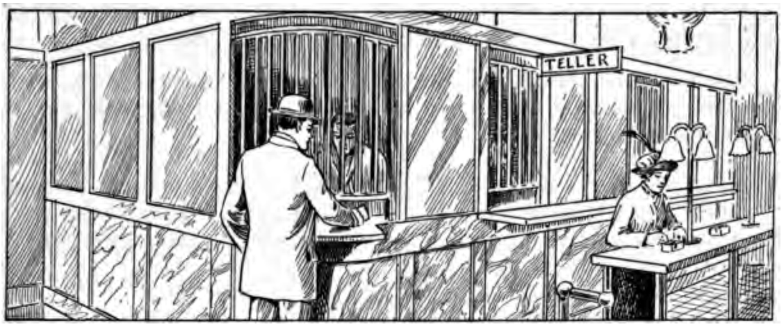
25. \$464 at 4 % for 3 mo.

26. \$232 at 4 % for 3 mo.

27. \$595 at 6 % for 2 mo.

* These facts in interest form the basis of the work in the following lessons in investments.

SAVINGS BANKS



The average young man or woman finds it impossible to save large amounts. His problem is to invest in the best manner possible the small sums which he can save. For such people the **savings bank** offers the best solution of the problem.

These small savings are very important to the young man, as they ordinarily represent all that he has. He therefore must run no risk of losing them. Savings bank deposits are the *safest* investments because such banks are governed by the strictest laws and can invest the depositor's savings only in the safest possible manner. They are *convenient*, because savings may be deposited in small amounts, and in case of need can be withdrawn. In addition, the depositor receives compound interest at rates ranging from 3% to $4\frac{1}{2}$%.

Compound interest is interest on the deposit and on the accumulated interest as well. When we invest money anywhere else, we collect the interest as it becomes due us; but in a savings bank we usually leave it to be added to the principal. When interest for the next period is computed, it is reckoned on the deposit plus the interest for the last period. These periods as a rule are 6-month periods — interest usually being computed Jan. 1 and July 1. Banks can pay this interest because the money deposited is lent on notes drawing 6% interest, on first mortgages paying 5% or 6%, or in other safe and profitable investments.

Compound Interest

1. If $100 was deposited Jan. 1, 1915, in a bank paying 4% interest, how much was due the depositor Jan. 1, 1916?

Note. — In all the problems on pages 228 and 229 the interest is compounded semiannually, that is, the interest for each half year when due, is added to the principal.

$100.00,	deposited Jan. 1 at 4% is entitled on July 1 to 2% interest,
2.00	or $2.
$102.00,	amount in bank July 1, 1915, is entitled on Jan. 1, 1916, to 2%
2.04	interest, or $2.04.
$104.04,	amount in bank Jan. 1, 1916.

Interest is not reckoned on cents.

Find the amount due Jan. 1, 1916, at 4% interest, on the following deposits made Jan. 1, 1915:

2. $200.	5. $350.	8. $500.	11. $600.
3. $250.	6. $400.	9. $700.	12. $820.
4. $300.	7. $450.	10. $1200.	13. $1500.

14. Find the amount due Jan. 1, 1916, on $240 deposited at 4% Jan. 1, 1914.

$240.00,	deposited Jan. 1, 1914.
4.80,	6 months' interest computed July 1, 1914.
$244.80,	amount in bank July 1, 1914.
4.88,	6 months' interest on $244 computed Jan. 1, 1915.
$249.68,	amount in bank Jan. 1, 1915.
4.98,	6 months' interest on $249, computed July 1, 1915.
$254.66,	amount in bank July 1, 1915.
5.08,	6 months' interest on $254, computed Jan. 1, 1916.
$259.74,	amount in bank Jan. 1, 1916.

If the following deposits were made Jan. 1, 1914, how much did each amount to Jan. 1, 1916, at 4%?

15. $140. 16. $420. 17. $265. 18. $1000.

Interest on Deposits

Interest is computed at the end of each six months.

Interest is reckoned on dollars only.

Interest is added to the last amount.

Written Exercise

1. Wm. R. Reed had $450 in the bank Jan. 1, 1914. It remained two years, drawing interest at 4 % compounded each six months. How much could he withdraw Jan. 1, 1916?

2. Mr. Hay sold a horse for $270 and deposited the money July 1, 1913 at 4 %. How much was due him July 1, 1915?

3. On the latter date he added enough to bring his deposit up to $350 and left it there a year and a half. How much was due him?

4. How much is due on a $382 deposit left 2 yr. at 4 %?

5. How much is due on a balance of $180.70 in the bank Jan. 1, 1913, left undisturbed until July 1, 1915, at 4 %?

6. Mrs. Crane has a balance of $380 on the books Jan. 1. How much will she have at the end of two years, at 4 % interest, if she makes no additions or withdrawals?

7. Reckon the compound interest on a deposit of $450.70 from Jan. 1 to July 1 at 3 % per year.

$450.70 in bank Jan. 1.

$450,	amount to draw interest, as interest is not reckoned on cents.
.01½,	rate for 6 months.
6.75,	interest for 6 months.
450.70,	original principal.
$457.45,	amount in bank July 1.

8. How much is due on a $750 deposit left in 18 mo. at 3 % per annum?

9. How much is due on $200 deposited Jan. 1, 1914 and withdrawn July 1, 1915, at 3 %?

Interest Dates

It is a common practice to allow money to go on interest each 3 months, although interest is computed but twice a year. Deposits usually go on interest Jan. 1, Apr. 1, July 1, and Oct. 1. These are called **interest dates**.

1. If money was deposited on each of the following dates, when would it begin to draw interest?

Jan. 15	Mar. 31	Sept. 30
Feb. 16	Aug. 12	Oct. 15
July 8	June 27	Nov. 18
Dec. 20	July 15	Dec. 31

2. What should a depositor keep in mind if he has savings accumulating, which he wishes to deposit to the best advantage?

Helps to understand the Depositor's Call Book

Some thrifty people make small deposits at frequent intervals, as shown in the following page of a young man's deposit book:

Sample Page in Deposit Book or Call Book

PURITAN SAVINGS BANK

Account of Arthur Brown

Date		Deposits		Withdrawals		Interest		Balance	
Jan.	1	200	—					200	—
Feb.	8	50	—					250	—
Mar.	15	10	—					260	—
Apr.	1	15	—					275	—
May	20	20	—					295	—
June	6	15	—					310	—
July	1	10	—			4	75	324	75
Sept.	15	20	—					344	75
Oct.	1	10	—					354	75
Nov.	25	25	—					379	75
Jan.	1					6	78	386	53

Deposit Book Balances

Whenever money is deposited or interest is computed, it is added to the amount already in the bank, and the sum is written in the last column. In this way the last balance represents the money credited to the depositor at any given date. To understand how each balance on page 230 was obtained, answer each of the following **guide questions** and do the work indicated, reckoning interest at 4 % per annum compounded semiannually.

1. How much money goes on interest Jan. 1? How do you get the following balances: \$200, \$250, \$260, \$275, \$295?

2. From what date do the second, third, and fourth deposits draw interest? What is the total of these three deposits? On July 1, how much interest is due on them for 3 months?

3. When interest is reckoned on July 1, how much of the deposit draws interest for 6 months? how much for only 3 months?

4. How much money deposited before July 1 does not draw any interest up to that time? Why?

5. How much do the 6 months' interest on \$200 and the 3 months' interest on \$75 amount to at 4 %? Where is this amount recorded? Explain the balance for July 1.

6. How much money draws interest from July 1 to the following Jan. 1? (See balance column. Omit the cents.) How much is the interest for this period of 6 months?

7. Read the two deposits that draw interest from Oct. 1 to Jan. 1. What is the total sum? How much is the interest for that period of 3 months?

8. The last deposit does not begin to draw interest until Jan. 1.

Note.—This page should be gone over by the class several times until the account on the opposite page is fully understood.

BROCKTON SAVINGS BANK

In account with M. R. Osgood
5570 Main St., City

Date	Deposit		Withdrawals		Interest		Balance	
Jan. 1	175	—					?	
Feb. 25	25	—					?	
Apr. 1	20	—					?	
Apr. 30	15	—					?	
May 25	10	—					?	
July 1	15	—			x —	—	?	
Aug. 4	20	—					?	
Sept. 1	15	—					?	
Oct. 1	10	—					?	
Nov. 19	25	—					?	
Dec. 1	30	—					?	
Jan. 1	10	—			y —	—	?	

Cashier's Entries in Deposit Book

Whenever a deposit is made, it is *added* to the last balance; and whenever money is drawn out, the withdrawal is ***subtracted*** from the last balance. On Jan. 1 and July 1, the interest is recorded and added to the balance. These semiannual additions of interest are made on the bank accounts and transferred to the deposit book whenever it is brought in.

Guide Questions

Copy the ruling of the deposit book on the opposite page; fill in the headings; make the first entry; and then follow the directions here indicated:

1. Record each consecutive balance through May 25.

2. On July 1 select the amount which draws 6 months' interest. Select the additional deposits made too late to draw 6 months' interest but in time to draw 3 months' interest. How much do they amount to?

3. How much deposited before July 1 bears no interest up to that date?

4. Find 6 months' interest on the $175, and 3 months' interest on the $45 at 4%, and record as one item at x.

5. Fill in the balances from July 1 to Dec. 1.

NOTE. — Get the July 1 balance by adding the $15 and x dollars to the May 25 balance.

6. How much draws interest from July 1 to Jan. 1?

7. How much draws interest from Oct. 1 to Jan. 1 only? Obtain this sum by adding the three deposits made too late to go on interest July 1 and early enough to go on interest Oct. 1.

8. Which two deposits do not draw interest before Jan. 1?

9. Compute interest on the July 1 balance for 6 months, and on $45 for 3 months, and record it as one item at y. Complete the Jan. 1 balance by adding $10 and y dollars to the Dec. 1 balance.

ACCOUNTS IN WHICH THERE ARE WITHDRAWALS

LAKEVILLE SAVINGS BANK

In account with HENRY O. CARVER

DATE	DEPOSITS		WITHDRAWALS		INTEREST		BALANCE	
Jan. 1	500	—					500	
Jan. 27	100	—					600	
Feb. 5			200	—			400	
Mar. 28			100	—			300	
Apr. 1	200	—					500	
May 5	100	—					600	
June 20			50	—			550	
July 1					?	?	?	

Guide Questions

1. Verify each balance in the above account, from Jan. 1 to June 20 inclusive.

2. On July 1, the bank reckoned interest. What was the *smallest balance* in the bank for the *entire first six months*, that is, from Jan. 1 to July 1?

When the balance column is filled out, it will be seen, at a glance, that \$300 was the *smallest balance* for the first 6 months.

3. What additional amount was in the bank all the time from Apr. 1 to July 1?

On Apr. 1, the balance (\$500) was \$200 *more than* the smallest balance (\$300) for the first 6 months. As the \$50 withdrawn June 20 was taken from the \$100 deposited May 5, \$200 was the *smallest additional balance* for the last 3 months.

4. Find the interest on \$300 for 6 mo. at 4 % per annum.

5. Find the interest on \$200 for 3 mo. at the same rate.

6. Add these two interest items, record the result in the interest column for July 1, and fill in the last balance.

CONTINENTAL SAVINGS BANK

In account with ARTHUR THOMAS

DATE	DEPOSITS		WITHDRAWALS		INTEREST		BALANCE	
1915								
July 1							558	
Aug. 5	200	—					?	
Sept. 10	100	—					?	
Oct. 1	150	—					?	
Nov. 20			400	—			?	
Dec. 6			100	—			?	
1916								
Jan. 1					?	?	?	?
Feb. 3	75	—					?	?
Mar. 8	40	—					?	?
Apr. 1	25	—					?	?
May 1	50	—					?	?
July 1					?	?	?	?

Guide Questions

1. Fill out on a separate slip of paper the balance for each date through Dec. 6.

2. The *smallest balance* between the dates July 1, 1915 and Jan. 1, 1916 was the amount entitled to draw interest for six months. What was the smallest balance?

3. What was the interest on it for 6 mo. at 4 %?

4. Fill out the balances from Jan. 1 to May, 1916.

5. What was the *smallest balance* between Jan. 1, and July 1, 1916? Compute 6 months' interest on this amount.

6. What additional amount was deposited on or before Apr. 1? Was any of it withdrawn before July 1? Compute 3 months' interest on $140.

7. Add the interest oblained in problems 5 and 6, record the result under July 1, and obtain the July 1 balance.

COÖPERATIVE BANKS; BUILDING AND LOAN ASSOCIATIONS

Coöperative banks and **building and loan associations** are similar institutions organized for much the same purposes as saving banks. They receive deposits, lend money on first mortgages, and pay semiannual interest on deposits.

Their method of doing business differs from that of savings banks as follows:

Instead of depositing miscellaneous amounts at any and all times, as in a savings bank, each depositor makes regular monthly payments of a stated amount. That is, he subscribes for a certain number of shares at $1 each. If he subscribes for *one* share, he deposits $1 each month until the share reaches maturity or is retired. If he subscribes for *five* shares, he deposits $5 each month. For any failure to pay the prescribed amount on or before a certain date, he must pay a **fine**, usually 2 cents a month on each share.

In this way, the bank has a definite amount of money coming in each month, which it lends immediately, usually at 6% interest. Loans are made *to depositors only*, who, as members of the association, are anxious to see it succeed. As a *borrower*, the member pays interest to the institution; but as a *depositor*, a part of this is returned to him in the form of dividends.

Coöperative banks provide an excellent means of saving for one whose income is regularly a little above his average expenses. If such a person attempted to save in any other way, the amount might seem so small that it might not be saved at all, whereas the coöperative bank encourages the systematic saving of small amounts. The fine of 2 cents a share for failure to deposit on time discourages habits of neglect. In the case of temporary need one can usually secure a loan from the bank and not be obliged to suffer loss by the withdrawal of shares.

A Sample Year's Record

The depositor has subscribed for 5 shares Jan. 15. Do the work indicated below the account. Interest, 5 % per annum.

Date	Deposits		Interest		Total	
Jan. 15	5				5	
Feb. 15	5				10	
Mar. 15	5				15	
Apr. 15	5				20	
May 15	5				25	
June 15	5				30	
Interest declared July 15				44	30	44
July 15	5				35	44
Aug. 15	5				40	44
Sept. 15	5				45	44
Oct. 15	5				50	44
Nov. 15	5				55	44
Dec. 15	5				60	44
Interest declared Jan. 15			1	20		

Directions for Verifying the above Account

1. Find how much interest (sometimes called ***dividend*** or ***profit***) has been earned up to the end of the first six months.

The first $5 has been in the bank how many months? ——
The second $5 has been in the bank how many months? ——
The third $5 has been in the bank how many months? ——
The fourth $5 has been in the bank how many months? ——
The fifth $5 has been in the bank how many months? ——
The sixth $5 has been in the bank how many months? ——
Total number of months ——

2. Compute the interest at 5 % on each $5 for the number of months which it has been deposited. Add the results. (Compute first at 6 %; then subtract $\frac{1}{6}$ of the result.)

3. Compute the interest on \$5 at 5 % for 21 months. Compare the answers in Ex. 2 and 3. (Count 5 mills or over in final result as one cent.)

4. At the end of the second 6 months, the \$30.44 is entitled to six months' interest. The regular deposits draw interest as in example 3. The sum of the two would be the interest to record at the bottom of the account. Verify the amount printed. This interest cannot be withdrawn but must be left with the deposits.

Notice that coöperative banks, unlike savings banks, allow interest on cents.

A Depositor who Borrows

5. Mr. Ames subscribes for 5 shares and borrows \$1000 to help him build a house, giving a first mortgage as security.

He must pay the regular dues of \$5 each month and in addition *one month's interest on the \$1000 at 6 %*. How much does he pay in all each month?

Memorandum of Monthly Payments

Receiving Dates	Deposits on Shares		Interest on Loan		Total Monthly Payments	
Jan. 15	5		5		?	
Feb. 15	5		5		?	
Mar. 15	5		5		?	
Apr. 15	5		5		?	
May 15	5		5		?	
June 15	5		5		?	
July 15	5		5		?	
Aug. 15	5		5		?	
Sept. 15	5		5		?	
Oct. 15	5		5		?	
Nov. 15	5		5		?	
Dec. 15	5		5		?	

Questions on the Preceding Memorandum

1. At the end of the year, how much money has been paid in deposits?

2. How much has been paid in the form of interest?

3. How much has been paid in all?

NOTE.—It might be supposed that the $ 60 paid in regular dues would reduce the face of the mortgage, but this is not the case. The mortgage still continues at $ 1000 and the $ 60 deposited draws its share of the interest which the bank earns. In the end this will go toward paying the loan. If an additional sum of $ 200 were paid at the end of the first year, the amount on which interest would have to be paid would be only $ 800. The regular dues, however, would not change.

4. Suppose that Mr. Ames paid $200 of his debt at the end of the first year, how much would he be obliged to pay *each month* of the succeeding year for *dues and interest?*

When a shareholder first opens an account with a coöperative bank it is usually his intention to continue the payment of dues until the shares mature, that is, in about 12 years, when the accumulated dues and interest would amount to $ 200 per share.

Advantages in paying the $ 1000 loan by the coöperative bank method.

5. Answer the following questions:

(*a*) How much did Mr. Ames pay in deposits in 12 years? (See Ex. 1 for amount paid in 1 year.)

(*b*) How much interest did he pay in 12 years if he did not cancel any part of the loan? (See Ex. 2 for interest paid in 1 year.)

(*c*) How much did he pay into the bank in *deposits and interest* in 12 years?

(*d*) In about 12 years, his five shares matured, amounting to $200 each and paying off the loan of $1000. How much of all that he paid in was really interest?

$60,	paid each year as deposits.
60,	paid each year as interest.
$120,	total payments in 1 year.
12	
$1440,	total payments in 12 years.
1000,	amount of loan.
$440,	paid in excess of amount of the loan. This is, therefore, the amount of interest which he had to pay by taking his loan from a coöperative bank.

(*e*) Suppose that he had borrowed $1000 elsewhere at 6 % interest, to how much would the interest have amounted in 12 years if he made no payments on the principal? What is the difference?

How a coöperative bank pays 5 % interest and has enough left to pay its running expenses:

1. In a small city bank the income from **fines** alone was $ 666 last year.

The income from loans at 6 % was $ 30,076.

The bank declared a 5 % dividend, that is, it divided up $\frac{5}{6}$ of the $ 30,076 among its shareholders. How much did it divide up?

2. How much was left?

3. One half of this remainder was put into the **reserve fund** and an equal amount was used in paying the running expenses. How much was used for this purpose?

4. The income from fines and the amount just obtained provided the two principal sums necessary to pay the running expenses. How much did they amount to?

REVIEW OF INTEREST FOR SHORT PERIODS

To find $\frac{1}{10}$ of any number, move the decimal point 1 place to the left.

To find $\frac{1}{100}$ of any number, move the point 2 places to the left.

To find $\frac{1}{1000}$ of any number, move the point 3 places to the left.

Application to Interest

The interest at 6 % on any principal

for 20 months = $\frac{1}{10}$ of the principal;
for 2 months = $\frac{1}{100}$ of the principal;
for 6 days = $\frac{1}{1000}$ of the principal.

Oral Exercise

Find the interest at 6 % on:

1. $500 for 2 mo.
2. $720 for 20 mo.
3. $875 for 1 mo.
4. $260 for 4 mo.
5. $400 for 5 mo.
6. $850 for 10 mo.
7. $600 for 3 mo.
8. $200 for 15 mo.
9. $900 for 6 da.
10. $500 for 3 da.
11. $340 for 1 mo.
12. $480 for 60 da.
13. $520 for 30 da.
14. $180 for 2 da.
15. $210 for 10 mo.
16. $530 for 6 da.

Professional accountants, who often have to compute interest for odd periods of time, use interest tables. Any one who wishes to reckon such interest for himself may find it convenient to set down the work in some such manner as on page 242. The period of 10 mo. may be considered as $\frac{1}{2}$ of 20 mo. or as 5×2 mo.; in like manner, 5 mo. may be considered as $\frac{1}{4}$ of 20 mo. or $2\frac{1}{2} \times 2$ mo.

Written Exercise

1. Find the interest on \$480 for 7 mo. 12 da. at 6 %.

Interest for 2 mo. is \$4.80	
Interest for 7 mo. is 3½ × \$4.80 or	\$16.80
Interest for 6 da. is \$.48~~0~~	
Interest for 12 da. is 2 × \$.48 or	.96
Total interest at 6 % is	\$17.76

To find interest at 5 %, subtract ⅙ of \$17.76; at 4 %, subtract ⅓ of \$17.76; at 3 %, find ½ of \$17.76; etc.

Find interest at 6 % on:

2.	\$85	4 mo. 12 da.
3.	\$200	3 mo. 24 da.
4.	\$125	4 mo. 1 da.*
5.	\$250	20 da.
6.	\$550	5 mo. 18 da.
7.	\$75	5 mo. 12 da.
8.	\$280	6 mo. 3 da.
9.	\$15	2 mo. 2 da.
10.	\$135	6 mo. 24 da.
11.	\$225	8 mo. 12 da.
12.	\$270	3 mo. 15 da.
13.	\$175	7 mo. 15 da.
14.	\$280	8 mo. 2 da.
15.	\$310	27 da.
16.	\$240	3 mo. 2 da.
17.	\$350	45 da.
18.	\$415	21 da.

At the rates indicated on:

19.	\$75	2 mo. 15 da.	5 %.
20.	\$220	8 mo. 15 da.	4 %.
21.	\$90	19 da.	6 %.
22.	\$210	5 mo. 2 da.	5 %.
23.	\$260	10 mo. 9 da.	4 %.
24.	\$45	7 mo. 6 da.	3 %.
25.	\$120	1 mo. 24 da.	4 %.
26.	\$275	11 mo. 12 da.	5½ %.
27.	\$300	2 mo. 15 da.	4½ %.
28.	\$150	9 mo. 13 da.	3½ %.
29.	\$180	6 mo. 2 da.	5 %.
30.	\$400	29 da.	6 %.
31.	\$325	1 mo. 4 da.	5 %.
32.	\$420	5 mo. 7 da.	5½ %.
33.	\$600	3 mo. 14 da.	4½ %.
34.	\$245	8 mo. 18 da.	5 %.
35.	\$500	5 mo. 5 da.	4 %.

* Express mills, if any, until the answer is written; then count 5 mills or over as 1 cent and disregard less than 5 mills.

LENDING MONEY ON NOTES

Savings bank deposits as a rule offer the safest and most convenient investment for the small saver, but some people wish their savings to earn more than $3\frac{1}{2}\%$ or 4%. A person known to have a surplus of money on hand is often asked to lend amounts like \$50, \$100, or \$200 and to take a **promissory note** from the borrower.

Sums of money lent in this way can be made to earn much more interest than in the average savings bank, as the interest guaranteed by a promissory note is usually 5% or 6%. The risk of losing money is balanced by the higher rate of interest. Cautious lenders reduce the risk by being very careful to whom they make loans.

1. Oliver Anderson wishes to obtain \$200 to help him harvest his crops. He borrows it of Edward T. Baker and gives him the following note:

200\frac{00}{100}$	*Newtown, N. Y., Sept. 1, 1916.*
Three months after date I promise to pay to	
Edward T. Baker or order	
Two Hundred and $\frac{00}{100}$ *Dollars.*	
Value Received. *Interest at 6%.*	*Oliver Anderson.*

Who has the money?

Who keeps the note?

On what date should the note be paid?

2. Compute the interest and tell how much money Mr. Anderson will turn over to Mr. Baker if he pays the principal and interest.

3. The note is receipted by writing across the face "Paid Dec. 1, 1916. Edward T. Baker." It is returned when the money is paid.

Who has the money after the note has been receipted?
Who has the note?
How has each benefited by the transaction?

4. Ernest O. White wishes $250 to pay for a surgical operation on his son. He applies to Henry A. Hastings, who lends him the amount Dec. 8, 1915, and takes a demand note beginning like the following:

$250 $\frac{00}{100}$.	*Los Angeles, Cal., Dec. 8, 1915*
______________ *On demand I* ______________ *promise to pay to*	
____ *or order*	
____ $\frac{00}{100}$ *Dollars.*	
Value Received. *Interest at 5%.*	______________________________

Read the note with the blank spaces filled in. Study it carefully, and write it from memory.

NOTE. — While this note permits Mr. Hastings to ask for payment at any time, it also allows Mr. White to pay the money as soon as he desires. In case Mr. White should take an undue length of time to pay the note, Mr. Hastings would have the right to call for his money with interest. Such notes are common among people who know each other well and have confidence in each other's fairness.

5. Mr. White earned the money and paid the note June 8, 1916. How much interest did he have to pay for its use? Tell what Mr. Hastings would write across the face of the note. Receipt your own copy in the same way.

Finding the time between dates.

Demand notes, like the preceding, are not necessarily paid at the end of *even* months. Consequently it becomes necessary to compute the time between the writing and the payment of the note. These periods are usually less than a year.

1. Find the exact number of days between June 17 and Aug. 12.

June 17 to June 30,	13 da.
July,	31 da.
August,	12 da.
Total time,	56 da.

Compute the difference in time between the following dates:

2. Mar. 25, 1914 to Sept. 30, 1914.
3. June 5, 1914 to May 16, 1915.
4. July 29, 1914 to April 5, 1915.
5. Sept. 4, 1914 to July 20, 1915.

6. The accounts of Franklin P. Whitcomb show loans to various people as indicated in the following table. Read aloud the wording of each note. Compute the time for which each of the demand notes would draw interest and the interest due on each note.

No. of Note	Name of Borrower	Date	Face	Time	Rate	When Due	Interest
21	Jas. T. Smith	Feb. 5	$350	3 mo.	6%	?	?
22	Geo. A. Brown	Mar. 17	$180	60 da.	$4\frac{1}{2}$%	?	?
23	A. B. Lane	Apr. 5	$ 85	Demand	4%	Paid June 20	?
24	C. P. Burr	Apr. 27	$ 45	90 da.	$5\frac{1}{2}$%	?	?
25	A. C. Curtis	June 8	$ 95	Demand	5%	Paid Aug. 30	?
26	J. R. Brooks	June 20	$160	Demand	6%	Paid Dec. 10	?

INVESTING IN MORTGAGES

Men who have a large amount of money to invest may lend it to people who want to build houses, but who have not enough capital for the purpose. The investor lends money enough to enable the borrower to build the house; but instead of taking a promissory note, takes a **mortgage**. This is a legal document having the general nature of a promissory note, but giving the lender a lien, or claim, on the property as security, until the loan, with interest, is paid.

Instead of expiring in 60 days or 3 months, as a note might do, the mortgage generally runs for a period of years, or indefinitely, as long as the borrower pays his interest regularly, usually twice a year. In such cases the borrower must keep his house insured against fire and may not let it get out of repair. People or banks who lend money in this way usually require the prospective builder to own the land and to build the cellar. They will then lend part of or all the money required to build the house. In this way the investor has security for more property than the value of the money lent, while the borrower enjoys full possession of the house.

If the borrower does not pay his interest when it is due and there is little prospect that he will be able to pay in the future, the investor may **foreclose**; that is, he may have the place sold, and after deducting the value of his mortgage and the interest, may return the surplus, if any, to the borrower.

If the investor, after taking a mortgage, needs money, he may sell the mortgage to some other person who in turn collects the interest as it falls due.

1. A. B. Stone owns an acre of land and has saved $1500. He wishes to erect a house which will cost $3500. He borrows $2000 from Mr. T. R. Smith, a wealthy neighbor, and gives

him a mortgage, agreeing to pay interest semiannually at 5 % per annum. How much will the interest be each six months?

2. If at the end of one year Mr. Stone not only pays the interest but also $150 of the principal, on how much will interest have to be paid the following year? How much will the interest be each six months?

3. At the end of the second year Mr. Stone pays $280 on the principal. How much remains to be paid?

4. What are Mr. Stone's semiannual payments this year?

5. Mr. Smith also lends $1575 to J. R. Turner, whom he charges $5\frac{1}{2}$ %. He allows him to pay the interest once a year. How much is the first payment?

6. If Mr. Smith had deposited the sum of $1575 in a savings bank, at $3\frac{1}{2}$ %, in time to draw compound interest both halves of the year, how much would it have earned? How much more did it earn by being invested in the mortgage?

7. Mr. Smith also owns a 6 % mortgage for $875 on the house of C. J. Burr. He sells this mortgage to Albert Jones. How much yearly interest does Mr. Smith lose? Who will collect this interest when it becomes due?

8. Make out a check on the State Street National Bank of Boston by which Mr. Burr pays the year's interest.

9. Make out the receipt which Mr. Jones gives Mr. Burr when the latter pays the interest.

Boston, Mass., Jan. 1, 1916.

Received from .... *C. J. Burr* ....

.... *Dollars*

one year's interest on mortgage ....

Albert Jones

BONDS

The average savings bank in the country will not take more than $3000 from any one depositor, although a man may deposit in the banks of several surrounding towns and cities. For this and other reasons, a successful business man, who has several thousand dollars at a time to deposit, may find that the savings banks do not meet his needs. If he does not wish to purchase a mortgage, the best investment is probably certain kinds of **bonds**.

If you examine a ten-dollar bill, you will find that it is a promise or guaranty of a bank or of the United States government to pay the bearer $10. We have the utmost confidence in both the government and the bank; so we consider the ten-dollar bill as good as ten gold dollars.

A **bond** is a written or printed promise to pay a sum of money at a certain time, with interest at regular intervals at a fixed rate. Bonds are issued by governments, railroads, cities, towns, corporations, etc. When governments need money to build canals, or cities require funds for sewer systems, or small towns for schoolhouses, they often have to borrow the money. They therefore issue a number of **bonds** and offer them for sale. Bonds are usually issued for $1000, although $500 bonds and bonds of smaller denominations may be secured.

The sum written on the face of the bond is called **the par value** or **face value**.

A business man having $3000 to invest may buy three $1000 city bonds. The city has his money to use, while he has the bond and can collect interest at $3\frac{1}{2}\%$, 4%, or even a higher rate, as specified in the bond itself.

A bond runs for a term of years, ten, twenty, or more, and the city is bound to pay the interest each year and the par value of the bond at the end of the specified term of years. Moreover, if the business man needs money, he can easily sell his bonds.


UNITED STATES OF AMERICA
STATE OF NEW YORK
Willard J. Rollins Company
NUMBER
201
DOLLARS
1000
FIRST MORTGAGE GOLD BOND
ONE THOUSAND DOLLARS
$1000
In Witness Whereof, WILLARD J. ROLLINS COMPANY has caused these presents to be signed by its President, and its corporate
WILLARD J. ROLLINS COMPANY

Oral Exercise

How much interest is due annually on the following bonds?

1. \$1000 5's (bearing 5 % interest).
2. \$1000 4's (bearing 4 % interest).
3. \$ 500 4's.
4. \$1000 6's.
5. \$1000 $3\frac{1}{2}$'s.
6. \$1000 3's.
7. \$1000 $4\frac{1}{2}$'s.
8. \$ 500 6's.

Written Exercise

If the following \$1000 bonds were purchased in 1915 and held by their purchasers until maturity (that is, until they were paid by the company that issued them), what would be the total interest for that period of years?

1. \$1000 5's, maturing in 1930.

1915 to 1930 = 15 yr.

5 % of \$1000 = \$50, interest for 1 yr. 15 × \$50 = \$750, interest for 15 yr.

	Name of Bond	Rate	Matures in
2.	Commonwealth Power Co.	4	1930
3.	L. & B. St. Ry. Co.	$4\frac{1}{2}$	1920
4.	Massachusetts	$3\frac{1}{2}$	1938
5.	City of Worcester	4	1924
6.	City of Newton	4	1923
7.	City of Albany	$4\frac{1}{2}$	1935
8.	City of Omaha, Neb.	$4\frac{1}{2}$	1941
9.	City of Nashville, Tenn.	5	1925
10.	City of Stamford, Conn.	$4\frac{1}{2}$	1929
11.	Toledo, Ohio	$4\frac{1}{2}$	1931
12.	San Francisco, Cal.	5	1951
13.	Sandusky, Ohio	5	1926

Selling Price and Income

Bonds that pay a good rate of interest, especially municipal bonds, are highly regarded as an investment. As the demand for them increases, their selling price rises. A man who wishes to buy bonds that pay $4\frac{1}{2}$ % interest issued by his own city may be willing to pay a little more than $1000. If they are quoted at 105, this means that the selling price is 105 % of $1000 (the par value), or $1050. On the other hand, bonds that pay only 3 % interest are not in such great demand and may sell for 85, which means 85 % of $1000 (the par value), or $850.

How much was paid for the following municipal bonds?

1. 3 Massachusetts 3's sold at 85.
2. 5 Bridgeport $4\frac{1}{2}$'s sold at 104.
3. 3 Stamford $4\frac{1}{2}$'s sold at 103.
4. 6 Dayton 5's sold at 108.
5. 8 Sandusky 5's sold at 104.

6. Compute the yearly income which each of the following men derives from the $1000 bonds which he holds.

(*a*) Mr. Blake owns 10 Buffalo $4\frac{1}{2}$'s, 8 Cleveland $4\frac{1}{2}$'s, and 5 Massachusetts $3\frac{1}{2}$'s.

(*b*) Mr. Gordon owns 15 City of Cambridge $3\frac{1}{2}$'s, 12 Providence 4's, and 7 Albany $4\frac{1}{2}$'s.

(*c*) Mr. Owens owns 13 City of Omaha $4\frac{1}{2}$'s, 6 Fitchburg R.R. 5's, 3 Swift & Co. 5's, and 8 Boston $3\frac{1}{2}$'s.

(*d*) Mr. Clarke owns 16 New Haven $4\frac{1}{2}$'s, 3 Baltimore 4's, and 20 N.Y. Central & Hudson River R.R. $4\frac{1}{2}$'s.

7. A certain railroad sold $ 25,000,000 worth of bonds and used the money to buy new cars, engines, and rails to extend their lines, and to build new stations. These bonds were for $1000 each and bore 4 % interest. How much interest did the railroad have to pay each year on these bonds?

8. Find the interest due annually on a $1000 bond at 3 %, $3\frac{1}{2}$ %, 4 %, $4\frac{1}{2}$ %, 5 %, 6 % ; the interest due semiannually.

9. Find the interest due annually on a $100 bond at each of the above rates ; on a $500 bond.

NOTE. — Banks, insurance companies, trust companies, and savings banks, which pay from 2 % to 4 % on deposits, must reinvest them in securities (notes, bonds, and mortgages) at a higher interest, in order to earn the interest and pay the expenses of the business.

SOME OF THE SECURITIES OWNED BY AN INSURANCE COMPANY

		PAR VALUE
First mortgage bonds — Chesapeake & Ohio R.R.	5 %	$ 84,600.00
First mortgage bonds — Chicago and W. Indiana R.R.	6 %	114,800.00
Montgomery County — Public Road bonds	$4\frac{1}{2}$ %	26,500.00
Houston & Texas Central R.R.	6 %	82,000.00
First mortgage bonds — Kansas Electric Co.	5 %	367,000.00

10. How much did the Chesapeake & Ohio R.R. pay the insurance company on the bonds it held ?

11. How much money did the insurance company invest in Chicago and Western Indiana R.R. bonds, if it bought them at par value ? Why did the insurance company invest so much in this particular bond ?

12. When Montgomery County started a campaign for better roads it had to borrow $100,000, which it did by selling $100 bonds. How many did the insurance company buy ? What interest did Montgomery County pay the company each year ? What interest did the county pay on its whole issue of Public Road bonds ? How was this interest probably raised ?

13. Find the semiannual interest on the Houston & Texas R.R. bonds.

14. What were the annual earnings from the Kansas Electric Co. bonds ?

REAL ESTATE INVESTMENTS

Mr. Brown decided to withdraw money from several savings banks, where he received only $3\frac{1}{2}$ % compound interest, which amounted to \$35.30 per year on \$1000, and to build several good two-family houses on some land which he owned.

1. The total investment in house No. 1 was as follows: Cost, \$3570; repairs, \$42.16; taxes on \$3500 at \$16.50 per thousand; insurance for \$3000 at $\frac{1}{8}$ % a year; 175,000 gal. water at \$.20 per 1000 gal. The upper tenement was rented for \$20 a month and the lower for \$25 a month. Find the total amount of the investment and the total yearly income:

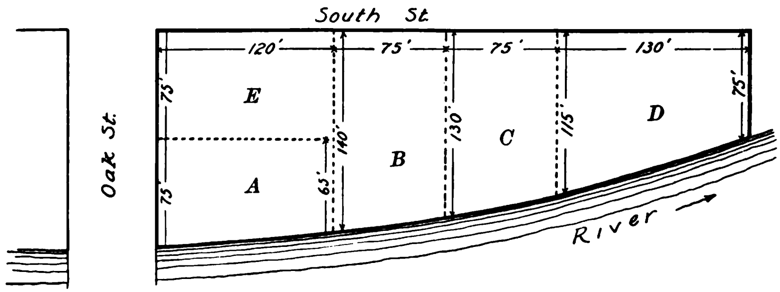
Money Invested			Income		
Original cost	3570		Rent for the year		
Repairs	42	16	Upper floor at \$20		
Taxes	?	?	per month . . .	?	?
Insurance	?	?	Lower floor at \$25		
Water bill	?	?	per month . . .	?	?
Total invested . .	?	?	Total income for year .	?	?

2. What per cent of the investment was the income?

3. The investment in house No. 2 was as follows: Cost, \$4870; repairs, \$117.40; taxes on \$4000 at \$15.40 per \$1000; insurance on \$4500 at $\frac{1}{4}$ % a year; 200,000 gal. water at \$.20 per 1000 gal. It rented for \$24 upstairs and \$30 downstairs. Arrange the year's account as in problem 1 and compute the rate of income.

4. Mr. Brown built a third house on some land which he bought for \$875. The house cost him \$3580; it was assessed for \$3200 and taxed at the rate of \$14.80 per \$1000. It was insured for \$3000 at $\frac{1}{8}$ % premium and the tenant paid the water tax. There was only one tenant, who paid \$30 per month. What was the yearly income? the rate of income?

SELLING REAL ESTATE



1. Compute the area of each lot in square feet. (Although the river curves somewhat, that side of each lot is so nearly straight that *A*, *B*, *C*, and *D* may be considered as trapezoids.)

2. The owner bought the land for $3000 and held it for two years before selling it or making improvements. It was assessed for $3200 and the tax rate was $15 per $1000 the first year and $16.20 per $1000 the second year. How much tax did he pay each year? What was the total tax for 2 years?

3. The $3000 with which he purchased the land was withdrawn from a savings bank, which paid 3 % interest compounded semiannually. How much compound interest did the owner lose during the two years?

4. Add to the first cost of the land the two years' compound interest lost and the two years' taxes paid. Divide the total by 5 to get the average cost of each lot at the end of the two years.

5. Early in the third year he sold lot *A* for $750 and lot *B* for $800. He erected a house on *C*, costing $2200, and sold the house and the lot for $3000. Compute the profit from these three transactions. (Consider the answer to problem 4 as the real cost of each lot at the time of the sale.)

STOCKS

The great temptation in investing one's surplus is the desire to get rich quickly by buying stocks. The words "stocks and bonds" are used together so frequently that boys and girls often think they mean the same thing. This is not true, however. A bond, as explained in the previous lesson, is a promissory note issued by a corporation, city, or town; and its *rate of interest is fixed* and *must be paid.*

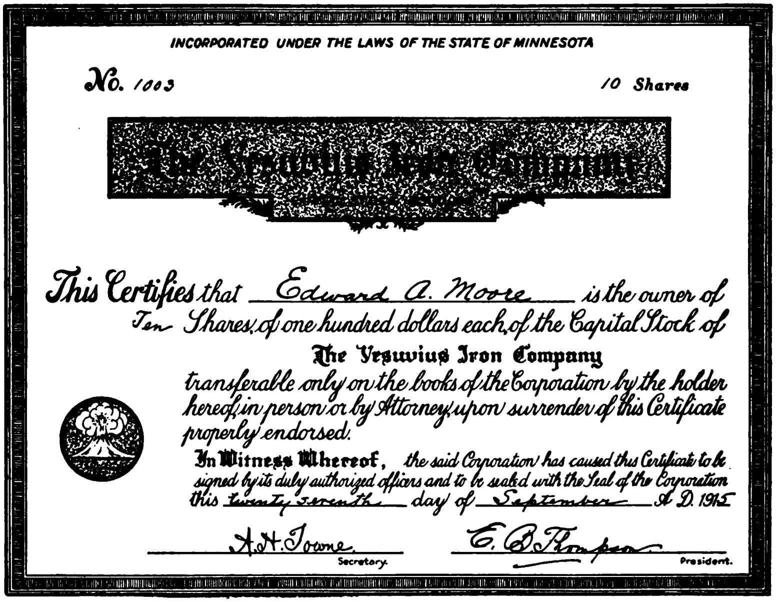
Stocks are shares in the property of a company and draw interest in the form of dividends *if* the company is doing a profitable business. If there are no profits, there are no dividends; while if the profits are large, the dividends are correspondingly large. Hence, you will see that bonds have a regular guaranteed income, while the income from stocks is uncertain.

Mining Stock. — A few men, believing that a certain tract of mountain land contains iron, may organize a company under the laws of the state. They may have money enough to buy the land but not enough to purchase machinery, to construct a spur railroad track, and to operate the mine. To secure this money they have blank certificates of stock printed similar to that on the next page. Brokers and agents take these certificates and sell them to people who can be persuaded to buy.

A person who buys 5 shares whose par value is \$100 each, becomes a shareholder in the mining company and part owner of its property. The company uses his money to operate the mine, and the shareholder hopes that enough iron will be found to pay him a larger return for his money than he would get from other investments.

If the mine is successful and the income during the year is \$50,000 above the expenses, this income will be divided among the stockholders. If the capital stock held by different stockholders is \$1,000,000, the dividend will probably be 5%.

$$\$50{,}000 = \frac{50000}{1{,}000{,}000} \text{ of } \$1{,}000{,}000;\ \frac{5\cancel{0000}}{1\cancel{000000}} \text{ of } 1\cancel{00}\% = 5\%, \text{ rate of dividend.}$$


INCORPORATED UNDER THE LAWS OF THE STATE OF MINNESOTA

No. 1003 10 Shares

This Certifies that Edward A. Moore is the owner of Ten Shares of one hundred dollars each of the Capital Stock of

The Vesuvius Iron Company

transferable only on the books of the Corporation by the holder hereof in person or by Attorney upon surrender of this Certificate properly endorsed.

In Witness Whereof, the said Corporation has caused this Certificate to be signed by its duly authorized officers and to be sealed with the Seal of the Corporation this twenty seventh day of September A.D. 1915

A. H. Towne, Secretary. E. B. Thompson, President.

The company may reserve $10,000 of the $50,000 for new machinery, etc., and divide only $40,000. What will the rate of dividend be in this case? If, however, the mine fails to produce any profits, not only is there no dividend but the stock itself becomes worthless. In this case it cannot be sold and the investor's money is lost, whereas if he had put it in a savings bank, it could have been drawn out at any time.

Caution. — *Never invest in stock which is extensively advertised or which an agent is trying hard to sell!*

If it were a good investment, it would sell without much advertising. "Not over one in 300 mining prospects ever pays dividends."

There are stocks which are very valuable and pay large dividends; but it needs an expert business man to select them. They should never be bought by an amateur.

The Uncertainty of Stock as an Investment. — If a certain stock is paying 6 % or 8 % annual dividend, it has much more earning power than money deposited in a savings bank. Such stocks, although having a *par value* of $100 a share, are worth more, and often sell for $110, $115, or more. If, on the other hand, a stock pays an annual dividend of only 2 %, it is less valuable and will perhaps sell for $90, $80, or even less per share.

1. A man bought a $100 share in the American Car and Foundry Company. As the company had not yet begun to pay dividends, he was able to buy a share for $64. The first year that he held it the company paid $3\frac{1}{2}$ % dividend. Soon after this, he sold his share for $93.75. What was the difference between the cost and the selling price? If he had purchased 50 shares at 64 and sold them at $93\frac{3}{4}$, what would have been the gain? the annual dividend?

2. His neighbor bought a $100 share of American Ice Company stock at 83 (that is, he paid $83 for one share). It failed to pay dividends, and he sold his share in 2 yr. for $39. How much did he lose? Find the additional loss in simple interest on $83 at 4 %.

3. Mr. Brown bought 3 shares of American Locomotive stock at 82 and sold them at $100\frac{1}{4}$ (that is, for $100.25 per share). How much did he make?

4. American Woolen stock started at $76\frac{1}{2}$. Mr. Bates bought 10 shares. How much did they cost him?

5. He kept them until they were selling at 82 and then sold them. What was the difference between the amount they cost him and the amount he received for them?

6. Mr. Cook bought one share of Continental Tobacco stock at 95 and sold it at 119. How much did he make?

7. A western farmer who had accumulated $20,000 invested $15,000 as follows. Compute his yearly income in the form of dividends and interest.

$3000 in Seattle bonds	at par, paying 6 %	yearly interest,	$——
4000 in Los Angeles bonds	at par, paying 5 %	yearly interest,	$——
1000 in Irrigation bonds	at par, paying 5½ %	yearly interest,	$——
2000 in 1st mortgage on store	6 %	yearly interest,	$——
2500 in 1st mortgage on store	8 %	yearly interest,	$——
2000 in 1st mortgage on farm	5 %	yearly interest,	$——
		Total yearly interest,	$——

8. Another western farmer, instead of trusting to bonds and mortgages, invested largely in stock as follows. Fill in the items.

12 shares of Eagle Mining stock	at 95, costing	$——
15 shares of Twin Peaks Mine stock	at 102, costing	$——
20 shares of Western Mfg. Co. stock	at 84, costing	$——
18 shares of Oil Co. stocks	at 103, costing	$——
	Total money invested	$——

9. Dividends are always reckoned on the par value, usually $100 a share.

The Eagle stock paid no dividends		
The Twin Peaks stock	paid 5 %, amounting to	$——
The Western Mfg. stock	paid 2 %, amounting to	$——
The Oil Co. stock	paid 6 %, amounting to	$——
	Annual income from his stocks,	$——

10. The farmer sold his stock as follows:

Eagle stock,	12 shares at 80, receiving	$——
Twin Peaks,	15 shares at 99, receiving	$——
Western Mfg.,	20 shares at 85, receiving	$——
Western Oil Co.,	18 shares at 105, receiving	$——
	Total receipts,	$——

11. How much did the stock shrink in value?

PERCENTAGE IN MISCELLANEOUS ACTIVITIES

Baseball

In computing the *batting average* or per cent, we must know the number of times the player comes to the bat (A.B.) and the number of hits (H.).

1. Player Smith, A.B. 24, H. 8. Find the batting average.

$\frac{8}{24}$ of 100% = $33\frac{1}{3}$%. This is expressed in baseball tables as .333, which is the *decimal* form — the two first figures giving the *per cent.*

2. What was the batting average of the following players?

	A.B.	H.		A.B.	H.
(*a*) Becker	514	167	(*e*) Connolly	399	122
(*b*) Wheat	533	170	(*f*) Cravath	499	149
(*c*) Dalton	442	141	(*g*) Miller	573	166
(*d*) Magee	544	171	(*h*) Fletcher	514	62

3. On July 15 the Philadelphia team had won 45 games and lost 32. What was the per cent won?

45 + 32 = 77, the number of games played.

$\frac{45}{77}$ of 100% = $\frac{4500}{77}$% = 58.4%, which is expressed in baseball tables as .584.

4. Find the per cent (to the nearest tenth) of games won by the following teams up to the date specified:

Team	Date	Won	Lost
Detroit	July 15	45	37
Washington		43	36
New York		30	47
Boston	Aug. 1	55	41
Chicago		47	49
Boston	Oct. 1	89	59
New York		68	81
St. Louis		69	80

School Attendance

5. In a school having 40 members, 5 were absent. What was the per cent of attendance?

$40 - 5 = 35$, number of pupils present.

$\frac{35}{4\cancel{0}}$ of $10\cancel{0}\% = 87\frac{1}{2}\%$ present.

6. Compute the per cent of attendance for each grade given below.

	Grade	Members	Absent		Grade	Members	Absent
(*a*)	I	40	4	(*e*)	V	32	4
(*b*)	II	38	2	(*f*)	VI	33	3
(*c*)	III	36	5	(*g*)	VII	37	5
(*d*)	IV	42	6	(*h*)	VIII	31	1

Wages

7. A 5% increase was declared in the wages of a certain class of operatives. How much should each of the following receive per day under the new scale?

		Old Wage			Old Wage
(*a*)	Mr. A	$2.50	(*e*)	Miss E	$1.95
(*b*)	Mr. B	3.00	(*f*)	Miss F	2.25
(*c*)	Mr. C	2.70	(*g*)	Miss G	2.14
(*d*)	Miss D	3.45	(*h*)	Miss H	2.00

8. Each of the following accountants had his year's salary increased as follows. What was the new salary?

		Old Salary	Increase			Old Salary	Increase
(*a*)	Miss L	$ 880	10 %	(*d*)	Miss R	$ 750	5 %
(*b*)	Mr. N	1040	$12\frac{1}{2}$%	(*e*)	Miss S	960	10 %
(*c*)	Mr. O	1260	$16\frac{2}{3}$%	(*f*)	Miss T	1200	$12\frac{1}{2}$%

9. After having his salary increased 10% ($\frac{1}{10}$) Mr. W received $880. What was the old salary?

\$880 is $\frac{11}{10}$ of old salary; old salary $= \$880 \div \frac{11}{10} = \$\overset{80}{\cancel{880}} \times \frac{10}{\cancel{11}} = \$800$.

10. After an increase of $12\frac{1}{2}\%$, Miss X received \$990. How much did she receive formerly?

11. After an increase of 30%, Mr. Z received \$2600. How much was he paid previously?

12. What is the per cent of increase when a salary of \$1000 is raised to \$1200?

$$\$1200 - \$1000 = \$200;\ \frac{\cancel{200}}{\underset{5}{\cancel{1000}}} \text{ of } \overset{20}{\cancel{100}}\% = 20\%.$$

13. The following employees of a large corporation had their weekly pay increased as shown below. What was the per cent of increase in each case?

	Old Rate	New Rate		Old Rate	New Rate
(*a*)	\$18.00	\$21.00	(*f*)	\$14.00	\$16.00
(*b*)	21.00	24.00	(*g*)	24.00	27.00
(*c*)	15.00	18.00	(*h*)	25.50	27.00
(*d*)	18.00	20.00	(*i*)	26.00	27.50
(*e*)	12.00	15.00	(*j*)	26.50	30.00

14. The following people were able to save the per cent of their salary indicated. How much did each save?

	Salary	Saved		Salary	Saved
(*a*)	\$1600	$2\frac{1}{2}\%$	(*e*)	\$1800	12%
(*b*)	1450	$4\frac{1}{2}\%$	(*f*)	4100	$8\frac{1}{3}\%$
(*c*)	975	$6\frac{1}{3}\%$	(*g*)	1750	2 %
(*d*)	2150	$7\frac{1}{2}\%$	(*h*)	1180	5 %

Miscellaneous

15. The following figures illustrate some very successful hatches with incubators. Compute the per cent of eggs which hatched, disregarding any fractional part of 1%.

	Number of Eggs Incubated	Number Hatched		Number of Eggs Incubated	Number Hatched
(*a*)	175	156	(*e*)	248	210
(*b*)	40	35	(*f*)	300	244
(*c*)	125	102	(*g*)	175	146
(*d*)	250	230	(*h*)	148	100

16. There are 32 fluid ounces in 1 qt. If a quart of a certain patent medicine contains 4 oz. of alcohol, what per cent of alcohol should be printed on the label?

17. What per cent of alcohol ought to be printed on the label of quart bottles containing the following amounts of alcohol?

(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)	(*g*)	(*h*)	(*i*)
5 oz.	6 oz.	$2\frac{1}{2}$ oz.	7 oz.	$1\frac{1}{2}$ oz.	3 oz.	$5\frac{1}{2}$ oz.	11 oz.	12 oz.

18. What per cent of alcohol is there in pint bottles of patent medicines containing the following amounts of alcohol?

(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)	(*g*)	(*h*)	(*i*)
1 oz.	$1\frac{1}{2}$ oz.	3 oz.	$1\frac{1}{4}$ oz.	5 oz.	$4\frac{1}{2}$ oz.	6 oz.	$5\frac{1}{2}$ oz.	$2\frac{1}{2}$ oz.

19. What per cent more expensive is:

(*a*)	English breakfast tea	@ 75¢ than Oolong		@ 64¢?
(*b*)	Java coffee	@ 32¢ than Mocha		@ 30¢?
(*c*)	Mocha coffee	@ 30¢ than Pan American		@ 18¢?
(*d*)	Home eggs	@ 60¢ than case eggs		@ 38¢?

20. What per cent was saved in buying coffee in 25-pound cases when prices were as follows?

Price of 1 Lb.	Price in 25-Lb. Lots
Java coffee 32¢	30¢
Maracaibo coffee 20¢	16¢
Mocha coffee 30¢	27¢
Pan American coffee 18¢	16¢
Rio coffee 16¢	14¢

21. What was the per cent of increase in the retail price of sirloin steak in a certain city from 1905 to each year mentioned below?

1905	1907	1908	1910	1915
28¢	30¢	32¢	34¢	38¢

INDEX

ANSWERS TO

HUNT'S COMMUNITY ARITHMETIC

Page 8. — **1.** 2 lb. 14 oz. **2.** 6 lb. 4 oz. **3.** 9 lb. **4.** 10 lb. 12 oz. **5.** 12 lb. 10 oz. **6.** 19 lb. 4 oz. **7.** $ .48; $ 2.08.

Page 10. —

	Price	1 Oz.	2 Oz.	3 Oz.	4 Oz.	5 Oz.	6 Oz.	7 Oz.	8 Oz.	9 Oz.	10 Oz.	11 Oz.	12 Oz.	13 Oz.	14 Oz.
1.	$ .22	$.01	$.03	$.04	$.06	$.07	$.08	$.10	$.11	$.12	$.14	$.15	$.17	$.18	$.19
3.	.26	.02	.03	.05	.07	.08	.10	.11	.13	.15	.16	.18	.20	.21	.23
	.30	.02	.04	.06	.08	.09	.11	.13	.15	.17	.19	.21	.23	.24	.26
	.36	.02	.05	.07	.09	.11	.14	.16	.18	.20	.23	.25	.27	.29	.32
	.38	.02	.05	.07	.10	.12	.14	.17	.19	.21	.24	.26	.29	.31	.33
	.40	.03	.05	.08	.10	.13	.15	.18	.20	.23	.25	.28	.30	.33	.35

Page 14. — **2.** $1.45.

Page 15. — **1.** $ 1.94. **2.** $ 1.49. **3.** $ 1.26. **4.** $ 1.65. **5.** $ 1.48. **6.** $ 1.09. **7.** $ 1.89.

Page 17. — **2.** $ 16.64. **3.** $ 19.35. **4.** $ 15.33. **5.** $ 2.63. **6.** $ 6.16. **7.** $ 3.61. **8.** $ 5.87. **9.** $ 5.87. **10.** $ 20.34. **11.** $ 16.66.

Page 18. — **1.** Received on Acct., $ 30.50; Received Cash, $ 32.02; Paid out, $ 5.57.

Page 19. — **2.** Received on Acct., $ 40.35; Received Cash, $ 48.92; Paid out, $ 6.54. **3.** $ 82.73. **4.** $ 84.90.

Page 20. — **5.** Front: Received on Acct., $ 22.15; Received Cash, $ 16.27; Paid out, $ 3.63. Back: Received on Acct., $ 50.20; Received Cash, $ 30.29; Paid out, $ 10.43.

Page 21. — **1.** Sales, $ 71.18; commission, $ 2.14.

Page 22. — **2.** Sales, $ 81.71; commission, $ 2.45. **3.** Sales, $ 94.12; commission, $ 2.82.

Page 23. — **1.** $ 154.15.

Page 24. — **2.** $ 49.65. **3.** $ 38.30. **4.** $ 45.55. **5.** $ 23.20. **6.** $ 25.

Page 25. — **7.** $ 24.60. **8.** $ 9.68. **9.** $ 5.32. **10.** $ 1.89. **11.** $ 9.28. **12.** $ 4.85. **13.** $ 75.76.

Page 26. — 2. $8\frac{5}{8}$ in. 3. $15\frac{1}{16}$ in. 4. $14\frac{7}{8}$ in. 5. $16\frac{3}{4}$ in. 6. $18\frac{3}{8}$ in. 7. $11\frac{15}{16}$ in. 8. $11\frac{5}{16}$ in. 9. $11\frac{7}{8}$ in. 10. $15\frac{5}{16}$ in. 11. $13\frac{5}{8}$ in. 12. $11\frac{15}{16}$ in. 13. $18\frac{5}{8}$ in. 15. $8\frac{7}{8}$ in. 16. $7\frac{5}{8}$ in. 17. $8\frac{1}{4}$ in. 18. $5\frac{5}{8}$ in. 19. $7\frac{11}{16}$ in.

Page 28. — 2. 24 in. 3. $3\frac{1}{8}$ in. 4. $13\frac{1}{8}$ in.; $6\frac{11}{16}$ in.; $9\frac{7}{8}$ in.; $6\frac{3}{16}$ in. 5. $3\frac{7}{8}$ in.; $7\frac{13}{16}$ in.; $5\frac{1}{8}$ in.; $9\frac{3}{16}$ in.; $4\frac{7}{16}$ in.; $1\frac{1}{8}$ in. 7. $2\frac{7}{8}$ in.

Page 29. — 8. (*a*) $4\frac{1}{2}$ in.; (*b*) $2\frac{3}{8}$ in.; (*c*) $10\frac{13}{16}$ in.; (*d*) $5\frac{7}{8}$ in.; (*e*) $6\frac{1}{8}$ in.; (*f*) $10\frac{5}{16}$ in. 9. (*a*) $3\frac{3}{4}$ in.; (*b*) $6\frac{5}{8}$ in.; (*c*) $7\frac{1}{2}$ in.; (*d*) $5\frac{3}{4}$ in.; (*e*) $3\frac{3}{4}$ in. 10. (*a*) $1\frac{1}{8}$ in.; (*b*) $3\frac{7}{8}$ in.; (*c*) $2\frac{7}{8}$ in.; (*d*) $\frac{7}{8}$ in.; (*e*) $1\frac{5}{8}$ in.; (*f*) $2\frac{3}{8}$ in. 11. (*a*) $2\frac{3}{8}$ in.; (*b*) $2\frac{1}{4}$ in.; (*c*) 2 in.; (*d*) $\frac{5}{8}$ in. 12. $1\frac{3}{8}$ in. 13. (*a*) $\frac{7}{8}$ in.; (*b*) $\frac{5}{8}$ in.; (*c*) $\frac{3}{8}$ in.; (*d*) $\frac{3}{4}$ in.; (*e*) $1\frac{3}{8}$ in.; (*f*) $\frac{1}{2}$ in.

Page 31. — 1. 4 lengths. 2. 6 boards. 3. 2 boards, 6 ft. not used. 4. 2 ft. or 24 in. 5. 20 running feet; 2 boards (4 ft. not used). 6. $4\frac{1}{2}$ strips used, necessitating sawing up 5 strips. 7. 2 in. or $\frac{1}{2}$ the strip. 8. $11\frac{2}{3}$ ft. 9. $1\frac{1}{2}$ ft. 10. 14 ft. 11. 15 ft.

Page 32. — 1. 25 in. 2. (*a*) 24 in.; (*b*) 27 in. 3. $20\frac{1}{2}$ in. 4. (*a*) $20\frac{3}{4}$ in.; (*b*) $18\frac{1}{8}$ in. 5. $6\frac{1}{8}$ in. 6. (*a*) $5\frac{5}{8}$ in.; (*b*) $10\frac{1}{4}$ in.; (*c*) $9\frac{7}{16}$ in.; (*d*) $8\frac{3}{8}$ in. 7. (*a*) $2\frac{3}{4}$ in.; (*b*) $\frac{5}{8}$ in.; (*c*) $3\frac{3}{4}$ in.

Page 35. — 16. $1.63. 17. $24.72; $13.46.

Page 36. — 1. Ames, $121.80; Brown, $104.20; Cook, $100.54; Dunn, $97.06; Stone, $145.66; Poole, $123.23; Howe, $137.74; White, $130.50. 2. Brown and Dobel: Mon., $59.69; Tue., $66.33; Wed., $64.64; Thu., $74.03; Fri., $79.51; Sat., $79.40. Hanson and Stone: Mon., $89.47; Tue., $94.33; Wed., $80.02; Thu., $85.48; Fri., $87.82; Sat., $100.01.

Page 37. — 1. $.50; $7.50. 2. $.35; $4.38. 3. $1.50; $22.88. 4. $2.25; $11.25. 5. $.75; $4.13. 6. $.90; $4.28. 7. $.75; $2.81. 8. $1.50; $7.13. 9. $1.10; $12.10. 10. $.75; $20.25. 11. $1.00; $11.50. 12. $.25; $4.50. 13. $1.35; $10.13. 14. $.50; $4.13. 15. $.80; $10.40. 16. $1.10; $5.50. 17. $.85; $14.45. 18. $.50; $2.50. 19. $.85; $5.53. 20. $1.10; $8.80. 21. $.65; $7.80. 22. $1.30; $5.20. 23. $.40; $1.80. 24. $1.00; $19.50. 25. $.75; $6.00.

Page 39. — 1. $6.22. 2. $15.87. 3. $10.19. 4. $6.31. 5. $5.22. 6. $2.54. 7. $1.65. 8. $2.09. 9. $4.91. 10. $.70.

Page 40. — 3. $.49. 4. $.61. 5. $.81. 6. $2.21. 7. $.88. 8. $.32. 9. $.53. 10. $.15. 11. $2.25. 12. $.18. 13. $.58. 14. $.44. 15. $1.08. 16. $.86. 17. $.83. 18. $1.44. 19. $1.58. 20. $.93. 21. $1.95. 22. $.34. 23. $.63. 24. $.60.

Page 41. — 1. Total, $6.96. 2. Total, $8.88.

Page 42. — 1. $9.75. 2. $22.01. 3. $2.28.

Page 43. — 4. $9.75; $26.95. 5. $46.72. 6. $4.02. 7. $69.65. 8. $74.50.

Page 44. — 9. (*d*) $56.86.

Page 45. — 1. Nov., $12.22; Dec., $10.86; Jan., $10.43; Feb., $10.08; Mar., $8.00; Apr., $5.89; May, $5.14; June, $6.14; July, $7.12; Aug., $7.26; Sept., $6.63. 2. 3321 eggs. 3. $166\frac{1}{20}$ eggs. 4. $95.16. 5. $59.36. 6. $2.97.

Page 46.—**2.** (*a*) 184 doz.; (*b*) 66 doz.; (*c*) \$85.58; (*d*) \$49.78. **3.** Mar., 307 doz., income \$129.63, gain \$103.43; Apr., 271 doz., income \$105.06, gain \$69.96; May, 262 doz., income \$90.44, gain \$59.54; June, 227 doz., income \$61.75, gain \$30.35; July, 177 doz., income \$42.51, gain \$2.31; Aug., 281 doz., income \$69.06, gain \$38.16; Sept., 154 doz., income \$43.80, gain \$11.30; Oct., 131 doz., income \$40.12, gain \$7.72; Nov., 112 doz., income \$38.45, gain \$6.65; Dec., 145 doz., income \$61.25, gain \$36.05. **4.** 29,016 eggs. **5.** 2418 doz. **6.** \$848.47; No. **7.** \$465.57.

Page 49.—Nov.—Pen 1: 47 eggs, $3\frac{11}{12}$ doz., \$1.76; Pen 2: 51 eggs, $4\frac{1}{4}$ doz., \$1.91; Pen 3: 55 eggs, $4\frac{7}{12}$ doz., \$2.06. Dec.—Pen 1: 83 eggs, $6\frac{11}{12}$ doz., \$3.46; Pen 2: 97 eggs, $8\frac{1}{12}$ doz., \$4.04; Pen 3: 81 eggs, $6\frac{3}{4}$ doz., \$3.38. Jan.—Pen 1: 178 eggs, $14\frac{5}{6}$ doz., \$7.02; Pen 2: 181 eggs, $15\frac{1}{12}$ doz., \$7.24; Pen 3: 181 eggs, $15\frac{1}{12}$ doz., \$7.24.

Page 50.—Total value for Nov., \$5.74; Dec., \$10.88; Jan., \$21.60; Feb., \$18.50; Mar., \$17.07; Apr., \$16.80; May, \$13.35; June, \$11.79; July, \$13.23; Aug., \$13.87; Sept., \$13.10; Oct., \$13.67. Total number of eggs for Plymouth Rocks, 2038; Rhode Island Reds, 1927; White Wyandottes, 1948; for 3 pens, 5913 eggs; total yearly income, \$169.60.

Page 51.—1. $223\frac{1}{4}$ lb. **2.** \$31.26. **3.** Total income, \$200.86; total expense, \$112.40; net income, \$88.46.

Page 52.—1. 1439 eggs. **2.** \$50.38. **3.** \$26.00. **4.** \$76.38. **5.** \$3 for wire; \$8 for hoppers. **6.** \$30.95. **7.** \$45.43.

Page 55.—1. 6197 eggs; $516\frac{5}{12}$ doz. **2.** $116\frac{49}{53}$ eggs. **3.** Jan., \$22.26; Feb., \$21.64; Mar., \$28; Apr., \$23.12; May, \$23.06; June, \$19.55; July, \$16.25; Aug., \$14.75; Sept., \$12.56; Oct., \$8.66; Nov., \$48.84; Dec., \$11.75, **4.** \$250.44. **6.** \$151.71. **7.** \$313.96. **8.** \$162.25. **9.** \$3.06.

Page 56.—1. Pane A, 54 sq. in.; Pane B, 96 sq. in.; Pane C, 140 sq. in.; Pane D, 187 sq. in.; Pane E, 288 sq. in.; Pane F, 450 sq. in.; Pane G, 544 sq. in.

Page 57.—**3.** 18 in. × 34 in.; $83\frac{7}{8}$ sq. in. waste; \$.40. **4.** 16 in. × 30 in.; $45\frac{3}{8}$ sq. in. waste. **5.** (*a*) 11 in. × 17 in.; $25\frac{9}{16}$ sq. in.; \$.13; (*b*) 8 in. × 10 in.; $16\frac{5}{8}$ sq. in.; \$.05; (*c*) 10 in. × 14 in.; $16\frac{1}{4}$ sq. in.; \$.09; (*d*) 12 in. × 24 in.; 12 sq. in.; \$.19; (*e*) $13\frac{1}{2}$ in. × 26 in.; 26 sq. in.; \$.24; (*f*) 11 in. × 17 in.; $23\frac{1}{4}$ sq. in.; \$.13.

Page 59.—1. 60 in. **2.** 5 ft.; \$.65. **4.** 3 ft. 10 in. **5.** 6 ft. 2 in. **6.** 4 ft. 7 in. **7.** 3 ft. $5\frac{1}{2}$ in. **8.** 4 ft. 6 in. **9.** 3 ft. 11 in. **10.** 4 ft. 11 in. **11.** 5 ft. $1\frac{1}{2}$ in. **12.** 3 ft. $11\frac{1}{2}$ in. **13.** 5 ft. $8\frac{1}{2}$ in.

Page 60.—**14.** $5\frac{1}{2}'' \times 10\frac{1}{2}''$. **15.** $7\frac{1}{2}'' \times 10\frac{1}{2}''$. **16.** $8\frac{1}{2}'' \times 12\frac{1}{2}''$. **17.** Length, $14\frac{3}{4}$ in.; width, $8\frac{3}{4}$ in. **18.** 11 in. × 15 in. **19.** 11 in. × $15\frac{1}{2}$ in.; 11 in. × 17 in. **20.** (*a*) 6 ft. 1 in.; (*b*) 3 ft. 11 in.; (*c*) 10 in. × $16\frac{1}{2}$ in.; (*d*) $10\frac{1}{2}$ in. × 17 in.; (*e*) 11 in. × 17 in.; (*f*) $8\frac{1}{2}$ sq. in.

Page 61.—1. 5400 screws; 43,200 screws. **2.** 475,200 screws. **3.** 3300 gro. **4.** 4200 gro. **5.** Mr. Jones—51,300 per hour; 410,400 per day; 2850 gro.; Mr. Sampson—79,200 per hour; 633,600 per day; 4400 gro.; Mr. Moore—59,400 per. hour; 475,200 per day; 3300 gro.

Page 62.—No. 1, $1\frac{3}{8}$ in.; No. 2, $1\frac{3}{4}$ in.; No. 3, $2\frac{1}{4}$ in.; No. 4, $1\frac{1}{8}$ in.; No. 5, $2\frac{1}{2}$ in.; No. 6, 1 in.; No. 7, $2\frac{3}{4}$ in.; No. 8, $3\frac{1}{4}$ in.

Page 63. — **2.** 16. **3.** $16\frac{3}{19}$. **4.** $29\frac{1}{3}$. **5.** $75\frac{9}{13}$. **6.** $3\frac{1}{2}$. **7.** $1\frac{5}{9}$. **8.** 6. **2.** No. 1, $1\frac{7}{16}$ in.; No. 4, $1\frac{3}{16}$ in. **3.** No. 2, $1\frac{7}{8}$ in.; No. 3, $2\frac{3}{8}$ in.; No. 5, $2\frac{9}{16}$ in. to $2\frac{5}{8}$ in. **4.** No. 7, $2\frac{15}{16}$ in.; No. 8, $3\frac{7}{16}$ in. **5.** 11.3 nails. **6.** $1\frac{3}{16}$ in.; 10.1 nails.

Page 64. — **7.** $1\frac{7}{8}$ in.; 6.4 nails. **8.** 120 lb. **9.** 41− lb. **10.** 737.3 nails. **11.** 217.6 nails. **12.** $2\frac{7}{16}$ in.; 4.9 nails. **13.** 203+ lb. **14.** 25,872 nails. **15.** 6.09 lb. **16.** 196.91 lb. **17.** 3.75 lb.; 121.25 lb. **18.** 4 lb. 8 oz.

Page 65. — **1.** \$.60. **2.** \$.26. **3.** \$.93. **4.** \$.72. **5.** \$.50. **6.** \$.31. **7.** \$2.81. **8.** \$12. **9.** \$2.03. **10.** \$.67. **11.** \$1.12. **12.** \$2.22. **13.** \$13.50. **14.** \$4.22. **15.** \$6.

Page 66. — **1.** 8 sections. **2.** 8 cards; 64 cards.

Page 67. — **4.** 80 cards. **5.** 63 cards. **6.** 48 cards. **7.** 35 cards. **8.** 7 sheets cut, part of last sheet wasted. **9.** 16 sheets.

Page 68. — **10.** Flat letter, 160 sq. in.; Flat packet, 228 sq. in.; Demy, 336 sq. in.; Folio, 374 sq. in.; Double folio, 748 sq. in.; Packet folio, 456 sq. in.; Double cap, 476 sq. in.; Double royal, 1596 sq. in.; Medium, 414 sq. in. **11.** 16 noteheads. **12.** 7 sheets (as 6 sheets would give only 96 noteheads). **13.** Flat packet, packet folio, double royal. **14.** 250 sheets. **15.** Double cap. **16.** Folio, double folio. **17.** Folio, 250 sheets; Double folio, 125 sheets. **18.** Demy, 250 sheets; Medium, 125 sheets.

Page 70. — **1.** (*a*) 215 lb. or 2.15 cwt. (*b*) 370 lb. or 3.7 cwt. (*c*) 490 lb. or 4.9 cwt., etc. **2.** \$5. **3.** \$7.02. **4.** \$3.87. **5.** \$6.48. **6.** \$6.41. **7.** \$9.38; total, \$38.16.

Page 71. — **1.** No. 1, \$74; No. 2, \$94.88; No. 3, \$100.20. **2.** \$99. **3.** \$25. **4.** \$109.14. **5.** \$14.26. **6.** \$125.86. **7.** \$.075; \$.08; \$.082; \$.084; \$.085.

Page 73. — **1.** \$72.80. **2.** Total, \$78.03. **3.** Total, \$110.32. **4.** \$5.23. **5.** \$32.29. **6.** Rib, 13+%; Sirloin, 46+%; Round, 140%; Chuck, 23+%; Flank, 40%. **7.** $110\frac{1}{2}$ lb.; \$41.99.

Page 76. — **3.** \$.63. **4.** \$.51. **5.** \$.89. **6.** \$.61. **7.** \$.37. **8.** \$.33. **9.** \$1.51. **10.** \$2.56. **11.** \$.51. **12.** \$3.24. **13.** \$3.64. **14.** \$.60. **15.** \$.84. **16.** \$1.09.

Page 77. — **1.** \$3.15. **2.** \$.42. **3.** \$1.50. **4.** \$1.93. **5.** \$2.05. **6.** \$6.77. **7.** \$3.77. **8.** \$5.35. **9.** \$21.22. **10.** \$61.50. **11.** \$25.16. **12.** \$21.33. **13.** \$81.25. **14.** \$17.47.

Page 78. — **1.** \$86.40. **2.** \$86.40. **3.** \$91.80. **4.** \$86.80. **5.** \$50.80. **6.** \$81.60. **7.** \$108.40. **8.** \$170. **9.** \$56. **10.** \$124. **11.** \$21. **12.** \$16. **13.** \$32. **14.** \$23,400.

Page 79. — **1.** \$5.20. **2.** \$13.06. **3.** \$1.28. **4.** \$3.41. **5.** \$14.28. **6.** \$11.93. **7.** \$5.46. **8.** \$25.50. **9.** \$11.65. **10.** \$6.02. **11.** \$2.98. **12.** \$4.62.

Page 81. — **2.** (*a*) $833\frac{1}{3}$ bu.; (*b*) 750 bu.; (*c*) $585\frac{5}{7}$ bu.; (*d*) 1750 bu.; (*e*) $937\frac{1}{2}$ bu.; (*f*) 1250 bu.; (*g*) $633\frac{1}{3}$ bu.; (*h*) 500 bu. **3.** (*b*) \$.08. (*c*) \$.11$\frac{1}{3}$. (*d*) \$.032. (*e*) \$.076. (*f*) \$.051. (*g*) \$.096. (*h*) \$.096. **4.** 800 bu. **5.** \$81.60; \$.10. **6.** \$.93. **7.** \$.07; \$56. **8.** \$39.20. *9. \$75.60.*

Page 82. — **10.** $.11; $1.12. **11.** $.09. **12.** $.64. **13.** $.67; $21. **14.** 113 lb. **15.** $1.47. **16.** 18 bags. **17.** 31 bags. **18.** $546. **19.** $623.

Page 83. — **20.** $6.34. **21.** $8.27. **22.** $9.92. **23.** $10.43. **24.** $11.05.

Page 84 — $45.87.

Page 85. — **4.** $20\frac{4}{7}$. **5.** $22\frac{2}{5}$. **6.** $22\frac{2}{3}$. **7.** $22\frac{4}{7}$. **8.** $17\frac{5}{11}$. **9.** $8\frac{2}{5}$. **10.** $6\frac{2}{9}$. **11.** $8\frac{8}{11}$. **12.** $5\frac{1}{19}$. **13.** $6\frac{4}{7}$. **14.** 8. **15.** $3\frac{3}{5}$. **16.** $7\frac{7}{9}$. **17.** 6. **18.** 6. **19.** $6\frac{10}{19}$. **20.** $6\frac{9}{11}$. **21.** $4\frac{7}{26}$. **22.** $4\frac{16}{23}$. **23.** $16\frac{16}{21}$. **24.** $6\frac{10}{23}$. **25.** 6.

Page 87. — **2.** No waste. **3.** 4 lengths, 24 in. waste. **4.** The 14-foot board has only 8 in. waste.

Page 88. — **2.** 3 strips and waste. **3.** 5 strips and waste; 6 strips and waste. **4.** 4 strips; 5 strips and waste. **5.** The 8-inch board. **6.** The 9-inch board; because only 1 in. is wasted. **7.** 4 strips; 18 boards. **8.** 10 boards.

Page 89. — **1.** $1\frac{13}{16}$ in. **2.** $1\frac{1}{2}$ in.; $2\frac{5}{8}$ in.; $2\frac{5}{16}$ in.; $3\frac{3}{8}$ in.; $2\frac{7}{16}$ in. **4.** (*a*) 5 strips and waste. (*b*) 3 strips and waste. **5.** 1.7 miles. **6.** 150 ft. **7.** More revolutions. **8.** 25 in.; 4320 revolutions.

Page 91. — **2.** 10 ends and waste. **3.** 7 sides and waste. **4.** 7 sides with much waste. **5.** 11 sides and waste. **6.** 9 ends with much waste. **7.** 5 sides and waste. **8.** 20 boards. **9.** $98\frac{3}{4}$ in. **10.** $\frac{1}{16}$ in. **11.** $\frac{1}{8}$ in. **13.** 26 boards; 64 boards.

Page 92. — **1.** $20\frac{1}{16}$ in. **2.** The one which was tongued. **3.** $17\frac{7}{8}$ in., before; $17\frac{5}{8}$ in., after. **4.** $23\frac{11}{16}$ in., before; $23\frac{7}{16}$ in., after. **5.** $17\frac{7}{16}$ in., before; $17\frac{3}{16}$ in., after. **6.** $14\frac{3}{8}$ in., before; $14\frac{1}{8}$ in., after.

Page 93. — **7.** $21\frac{1}{4}$ in., before; $20\frac{3}{4}$ in., after. **8.** $20\frac{3}{16}$ in., before; $19\frac{11}{16}$ in., after. **9.** $16\frac{1}{2}$ in., before; 16 in., after. **10.** $13\frac{1}{8}$ in., before; $12\frac{5}{8}$ in., after. **11.** $\frac{1}{2}$ in.; $\frac{1}{2}$ in.; 21 in. **12.** $1\frac{5}{8}$ in. **13.** $2\frac{1}{8}$ in. **14.** $1\frac{1}{3}$ in. **15.** $\frac{7}{8}$ in. **16.** $13\frac{1}{4}$ in. **17.** $1\frac{1}{2}$ in. **18.** $1\frac{5}{8}$ in. **19.** $1\frac{1}{8}$ in. **20.** $\frac{7}{8}$ in.

Page 94. — **1.** $\frac{11}{16}$ in. **2.** $\frac{5}{8}$ in. **3.** $\frac{11}{16}$ in. **4.** $\frac{9}{16}$ in. **5.** $\frac{23}{32}$ in. **6.** $\frac{13}{32}$ in.

Page 96. — **2.** $23\frac{7}{8}$ in. **3.** $35\frac{5}{8}$ in. **4.** $31\frac{7}{8}$ in. **5.** $33\frac{1}{2}$ in. **7.** $24\frac{13}{16}$ in. **8.** $30\frac{1}{4}$ in. **9.** $30\frac{1}{4}$ in. **10.** $26\frac{3}{8}$ in.

Page 98. — **1.** $3\frac{9}{32}$ cd. **2.** $7\frac{1}{2}$ cd. **3.** $4\frac{1}{2}$ cd. **4.** $6\frac{3}{32}$ cd. **5.** $21.88. **6.** $60. **7.** $54.14. **8.** $73.83. **9.** $56.25. **10.** $47.81.

Page 99. — **1.** No. 1, 16 cu. ft.; No. 2, 32 cu. ft.; No. 3, 19 cu. ft.; No. 4, 38 cu. ft.; No. 6, 55 cu. ft.; No. 7, 30 cu. ft.; No. 8, 61 cu. ft.; No. 9, 39 cu. ft.; No. 10, 78 cu. ft. **2.** Cart No. 1. **3.** No. 2 and No. 7. **4.** No. 10. **7.** 1 ft.; 2 ft.; 3 ft. **8.** $2\frac{7}{16}$ cd.

Page 100. — **1.** 1895 lb. **2.** 1984 lb. **3.** 1945 lb. **4.** 2040 lb. **5.** 1995 lb. **6.** 2185 lb. **7.** 1906 lb. **8.** 1934 lb. **9.** 2055 lb. **10.** 1835 lb.

Page 101. — **1.** 1880 lb. **2.** 1265 lb.; 1650 lb.; 1781 lb.; 1460 lb.; 1535 lb.; 7691 lb. **3.** 1495 lb.; 1270 lb.; 1410 lb.; 1220 lb.; 5395 lb.

Page 102. — **4.** 4185 lb.; $20.93. **5.** 2750 lb.; 126 lb. **6.** 1204 lb.; 21½ bu.

2. 2.59 T. **3.** 4.32 T. **4.** 10.93 T. **5.** .185 T. **6.** .71 T. **7.** .94 T. **8.** 1.605 T. **9.** 6.525 T. **10.** 2.455 T.

Page 103. — **12.** (*a*) $5.36; (*b*) $4.16; (*c*) $3.88; (*d*) $6.24; (*e*) $5.07; (*f*) $6.79; (*g*) $5.10; (*h*) $4.87; (*i*) $2.67; (*j*) $6.39. **13.** (*a*) 2907 lb. (*b*) 2907 lb.; (*c*) 2395 lb.; (*d*) 2077 lb.; (*e*) 2896 lb.; (*f*) 3392 lb.; (*g*) 2950 lb.; (*h*) 1804 lb.; (*i*) 3395 lb.; (*j*) 3145 lb. **14.** (*a*) $7.99; (*b*) $7.99; (*c*) $6.59; (*d*) $5.71; (*e*) $7.96; (*f*) $9.33; (*g*) $8.11; (*h*) $4.96; (*i*) $9.34; (*j*) $8.65.

Page 104. — **1.** 4150 lb.; 17 lb.; 22 lb. **2.** 3220 lb.; 7 lb.; 15 lb.

Page 105. — **3.** Take off 16 lb. **4.** Take off 56 lb. **5.** 1412 lb. **6.** 1769 lb. **7.** 1500 lb.; $5.63. **8.** (*a*) 9000 lb.; (*c*) $33.30. **9.** 1870 lb.; 1790 lb.; 1940 lb.; 1900 lb.; 1500 lb. **10.** 8000 lb. or 4 T.

Page 106. — **2.** (*a*) $2.76; (*b*) $4.92; (*c*) $2.07; (*d*) $4.12; (*e*) $6.28; (*f*) $2.90; (*g*) $5.22; (*h*) $3.85; (*i*) $5.43; (*j*) $2.29. **3.** $6.82. **4.** $6.30. **5.** $16.54. **6.** $.04; $.08; $.12; $.17; $.21; $.25; $.29; $.33; $.37; $.41; $.83; $1.24; $1.65; $2.06; $2.48; $2.89; $3.30; $3.71; $4.13; $4.54; $4.95; $5.36; $5.78; $6.19; $6.60; $7.01; $7.43; $7.84; $8.25.

Page 108. — **2.** $76.35. **3.** $70.65. **4.** $73.95. **5.** $68.40. **6.** $83.25. **7.** $84.75. **8.** $34.34. **9.** $24.90. **10.** $20.13.

Page 109. — **11.** $28.01. **12.** $82.92. **13.** Total, 30,090 lb.

Page 111. — **2.** $1.61. **3.** $1.34. **4.** $.34. **5.** $1.07. **6.** $.70. **7.** $3.51. **8.** $2.05. **9.** $.55. **10.** $.61. **11.** $2.89. **12.** $3.16. **13.** $3.48. **14.** $3.96. **15.** $.66. **16.** $.98. **17.** $1.08. **18.** $1.36. **19.** $1.67. **20.** $1.65. **21.** $1.86. **22.** $2.57. **23.** $2.26. **24.** $4.64. **25.** $4.22. **26.** $3.37. **27.** $3.93.

Page 114. — **2.** $1.11. **3.** $2.25. **4.** $1.08. **5.** $3.45. **6.** $2.63. **7.** $1.28. **8.** $2.10. **9.** $1.80. **10.** $3.04. **11.** $4.39. **12.** $1.82. **13.** $.54. **14.** $1.13. **15.** $1.05. **16.** $1.11. **17.** $1.69. **18.** $1.95.

Page 115. — **3.** $.32. **4.** $.56. **5.** $.17. **6.** $.08. **7.** $.24. **8.** $1.60. **9.** $2.25. **10.** $1.44. **11.** $4.20. **12.** $1.50. **13.** $.52. **14.** $1.20. **15.** $.96. **16.** $1. **17.** $2.40. **18.** $1.68. **19.** $3.20. ***20.*** *$1.80.* **21.** $3. **22.** $4.80.

Page 116. — 3.

LENGTHS	16″ WIDE	18″ WIDE	20″ WIDE	22″ WIDE	24″ WIDE	26″ WIDE	28″ WIDE	30″ WIDE	32″ WIDE	34″ WIDE
1 ft.	\$.03	\$.03	\$.03	\$.04	\$.04	\$.04	\$.05	\$.05	\$.05	\$.06
2 ft.	.05	.06	.07	.07	.08	.09	.09	.10	.11	.11
3 ft.	.08	.09	.10	.11	.12	.13	.14	.15	.16	.17
4 ft.	.11	.12	.13	.15	.16	.17	.19	.20	.21	.23
5 ft.	.13	.15	.17	.18	.20	.22	.23	.25	.27	.28
6 ft.	.16	.18	.20	.22	.24	.26	.28	.30	.32	.34
7 ft.	.19	.21	.23	.26	.28	.30	.33	.35	.37	.40
8 ft.	.21	.24	.27	.29	.32	.35	.37	.40	.43	.45
9 ft.	.24	.27	.30	.33	.36	.39	.42	.45	.48	.51
10 ft.	.27	.30	.33	.37	.40	.43	.47	.50	.53	.57
4 in.	.01	.01	.01	.01	.01	.01	.02	.02	.02	.02
6 in.	.01	.02	.02	.02	.02	.02	.02	.03	.03	.03
8 in.	.02	.02	.02	.02	.03	.03	.03	.03	.04	.04
10 in.	.02	.03	.03	.03	.03	.04	.04	.04	.04	.05

Page 117. — **2.** \$.16. **3.** \$.08. **4.** \$.05. **5.** \$.19. **6.** \$.17. **7.** \$.30. **8.** \$.51. **9.** \$.15. **10.** \$.24. **11.** \$.36. **12.** \$.15. **13.** \$.32. **14.** \$.16. **15.** \$.22. **16.** \$.26. **17.** \$.72. **18.** \$.52. **19.** \$.72. **20.** \$.92.

Page 118. — **2.** 280 sq. ft. **3.** $108\frac{1}{2}$ sq. ft. **4.** $201\frac{1}{2}$ sq. ft. **5.** $365\frac{1}{2}$ sq. ft. **6.** 84 sq. ft. **7.** $381\frac{1}{2}$ sq. ft.

Page 119. — **2.** $352\frac{1}{2}$ sq. in. **3.** 405 sq. in. **4.** $139\frac{1}{2}$ sq. in. **5.** $31\frac{1}{2}$ sq. in. **6.** $5379\frac{1}{2}$ sq. in. **7.** $4\frac{3}{8}$ sq. ft. **8.** $1\frac{31}{288}$ sq. yd. **9.** $2\frac{1}{32}$ sq. ft.

Page 121. — **1.** $276\frac{1}{2}$ sq. ft.; $30\frac{13}{18}$ sq. yd. **2.** \$55.30. **4.** \$56.76. **5.** \$1.46.

Page 125. — **3.** 60 bd. ft. **4.** $133\frac{1}{3}$ bd. ft. **5.** 105 bd. ft. **6.** 640 bd. ft. **7.** 168 bd. ft. **8.** 100 bd. ft. **9.** 648 bd. ft. **10.** 576 bd. ft. **11.** 896 bd. ft. **12.** 140 bd. ft. **13.** $52\frac{1}{2}$ bd. ft. **14.** 60 bd. ft.

Page 127. — **1.** 45 bd. ft. **2.** 140 bd. ft. **3.** 120 bd. ft. **4.** 192 bd. ft. **5.** 98 bd. ft. **6.** 96 bd. ft. **7.** $346\frac{2}{3}$ bd. ft.

8.

10 ft.	20 bd. ft.	$26\frac{2}{3}$ bd. ft.	30 bd. ft.	40 bd. ft.
12 ft.	24 bd. ft.	32 bd. ft.	36 bd. ft.	48 bd. ft.
14 ft.	28 bd. ft.	$37\frac{1}{3}$ bd. ft.	42 bd. ft.	56 bd. ft.
16 ft.	32 bd. ft.	$42\frac{2}{3}$ bd. ft.	48 bd. ft.	64 bd. ft.
18 ft.	36 bd. ft.	48 bd. ft.	54 bd. ft.	72 bd. ft.
20 ft.	40 bd. ft.	$53\frac{1}{3}$ bd. ft.	60 bd. ft.	80 bd. ft.
22 ft.	44 bd. ft.	$58\frac{2}{3}$ bd. ft.	66 bd. ft.	88 bd. ft.
24 ft.	48 bd. ft.	64 bd. ft.	72 bd. ft.	96 bd. ft.

Page 128. — **1.** \$75. **2.** \$25.60. **3.** \$18. **4.** \$44.52. **5.** \$5.60. **6.** \$3.46. **7.** \$26.97. **8.** \$59.70. **9.** \$14.25. **10.** \$2.47. **11.** \$8.36. **12.** \$37.80. **13.** \$34.20. **14.** \$19.17. **15.** \$6.66. **16.** \$59.20. **17.** \$1.66. **18.** \$4.43.

Page 129. — **1.** \$9.84. **2.** \$28.04.

Page 130. — **3.** \$8.32. **4.** \$17.66. **5.** \$16.15. **6.** \$30.25. **7.** \$83.09.

Page 131. — **1.** 32′ × 36′. **2.** 4608 cu. ft. **3.** 170$\frac{2}{3}$ cu. yd. **4.** 231 loads. **5.** 154 loads. **6.** 448 sq. ft.; \$76.16.

Page 133. — **1.** 96 bd. ft. **2.** 72 bd. ft. **3.** 32 bd. ft. **4.** \$6.40. **5.** 400 bd. ft. **6.** \$12. **7.** \$14.

Page 134. — **8.** 28 ft.; 24 ft.; 24 ft. (approximately); 12 ft. (back, approximately); 16 ft. (front, approximately). **9.** 624 bd. ft. **10.** 10 joists; 213$\frac{1}{3}$ bd. ft. **11.** 309$\frac{1}{3}$ bd. ft. **12.** \$16.20.

Page 135. — **3.** 12.8 squares. **4.** 14.28 squares. **5.** 13.68 squares. **6.** 15.17 squares. **7.** \$40.32. **8.** \$49.98. **9.** \$47.20.

Page 136. — **1.** 106$\frac{2}{3}$ bd. ft. **2.** 10 ft.; 53$\frac{1}{3}$ bd. ft. **3.** 10 studs; 10 ft. long; 66$\frac{2}{3}$ bd. ft. **4.** 20 ft.; 8 strips; 106$\frac{2}{3}$ bd. ft.

Page 137. — **5.** \$8.38. **6.** 200 bd. ft. **7.** 800 bd. ft.; \$28. **8.** \$6.80.

Page 140. — **1.** 14 ft. 5 in. **2.** 10 ft.; 14 ft. 2 in. **3.** 11 ft. 2 in. **4.** 9 ft. 6 in.; 12 ft. 9 in.; 10 ft. 10 in. **5.** 19 ft. 9 in.; 15 ft. 8 in.

Page 141. — **1.** 240 sq. ft.; 240 bd. ft.; \$7.20. **2.** (*a*) \$5.12; (*b*) \$7.17; (*c*) \$6.30. **3.** (*a*) \$34.72; (*b*) \$27.90; (*c*) \$46.08. **4.** (*a*) About 1 day 7 hr.; (*b*) 1$\frac{1}{2}$ days; (*c*) 2$\frac{1}{2}$ days; (*a*) \$16.88; (*b*) \$13.50; (*c*) \$22.50.

Page 143. — **3.** \$42. **4.** \$64. **5.** \$43.20. **6.** \$24. **7.** \$49. **8.** \$93.50. **9.** \$63.

Page 144. — **1.** (*a*) 360 sq. ft.; (*b*) 240 sq. ft.; (*c*) 288 sq. ft. **2.** (*a*) 234 sq. ft.; (*b*) 160 sq. ft.; (*c*) 192 sq. ft. **3.** 1.6 M ft. **4.** \$56. **5.** \$56. **6.** \$24; \$36; total, \$60. **7.** \$172. **8.** 1170 sq. ft.

Page 145. — **2.** 11.16 squares requiring 12 rolls. **3.** 2 rolls; \$45.50. **4.** 13 rolls; \$33.80. **5.** \$9. **6.** Shingling house and porch, \$63; \$17.50 more.

Page 147. — **1.** (*f*) 15.86 squares or 16 squares; (*g*) \$50.40. **2.** Total, 20 squares; (*f*) \$84. **3.** (*g*) 830 sq. ft.; (*h*) 8.3 M.

Page 149. — **1.** Total, 1946 sq. ft.; (*f*) \$486.50. **2.** Total area of front and side, 976 sq. ft.; (*d*) 1952 sq. ft.; (*e*) 2304 sq. ft.; (*f*) 10 gal.; \$16.50.

Page 150. — **3.** (*e*) \$332.45. **4.** 1453 sq. ft. **5.** 14.53 squares; 14.53 M (probably 14$\frac{1}{2}$ M); \$50.75.

Page 151. — **1.** 1344 cu. ft. **2.** 33$\frac{3}{5}$ sq. ft. or 34 sq. ft. **3.** 53$\frac{12}{25}$ sq. ft. or 54 sq. ft. of surface. **4.** 29$\frac{1}{4}$ sq. ft. or 30 sq. ft. **5.** Parlor, 2430 cu. ft.; 297 sq. ft.; sitting room, 1890 cu. ft.; 126 sq. ft.; dining room, 2088 cu. ft.; 130$\frac{1}{2}$ sq. ft.; bedroom, 1575 cu. ft.; 238$\frac{1}{2}$ sq. ft.; first chamber, 1657$\frac{1}{2}$ cu. ft.; 238 sq. ft.; second chamber, 1326 cu. ft.; 102 sq. ft.

Page 153. — 1. 6.2832 in. 3. 201.0624 sq. in. 4. 2010.624 sq. in.; 13.962+ sq. ft. 5. 2638.944 sq. in.; 18.326+ sq. ft. 6. 30.543+ sq. ft. 7. 7+ sq. ft.; nearly 31 sq. ft. of radiation would have been wasted. 8. 8+ sq. ft.

Page 155. — 1. $17\frac{1}{2}$ sq. ft. 2. $16\frac{16}{45}$ sq. ft. 3. $15\frac{5}{23}$ sq. ft. 4. $239\frac{1}{5}$ cu. ft. 5. $216\frac{2}{3}$ cu. ft. 6. 260 cu. ft. 7. $81\frac{7}{9}$ sq. yd. 8. $140.40. 9. $48.60. 10. $75.60. 11. $60\frac{2}{3}$ sq. yd. or 61 sq. yd.

Page 156. — 1. $.14. 2. $.23. 3. $.28. 4. $.06. 5. $.09. 6. $.18. 7. $.36. 8. $.17. 9. $.15. 10. $.27. 11. $.05. 12. $.05. 13. $.25. 14. $.06. 15. $.14. 16. $.18. 17. $.06. 18. $.08. 19. $.43. 20. $.21. 21. $.12. 22. $.09. 23. $.20.

Page 157. — 1. 25%; $1.05. 2. $.02; $11\frac{1}{9}\%$; $.48. 3. $.10; 200%; $4.80. 4. $.07; $87\frac{1}{2}\%$. 5. 15+%. 6. 8+%.

Page 158. — 7. $.20; 25%; $.60. 8. $3.78; 100%. 9. $75.50. 10. $540. 11. $135. 12. $59.50. 13. $3094. 14. $450. 15. $135. 16. $50; $2600.

Page 159. — 2. $\$.11\frac{1}{2}$. 3. $\$.10\frac{1}{2}$. 4. $.44. 5. $.60. 6. $.63. 7. $\$1.50\frac{1}{2}$. 8. $\$1.83\frac{1}{2}$. 9. $\$.26\frac{1}{2}$. 10. $\$.12\frac{1}{2}$. 11. $.27. 12. $17. 13. $21.50. 14. $22.50. 15. $20.50. 16. $15.30. 17. $30. 18. $31.75. 19. $36.30. 20. $38.20. 21. $21. 22. $22.90. 23. $28. 24. $26. 25. $19.50. 26. $31. 27. $34.60. 28. $36.50. 29. $40.

Page 160. — 1. $12. 2. $11.34. 3. $11.60. 4. $20.15. 5. $11.70. 6. $18.86. 7. $43.78. 8. $6.50. 9. $10.81. 10. $7.80. 11. $15.24. 12. $11.40. 13. $14.99. 14. $21.36. 15. $22.75. 16. $13.95. 17. $40. 18. $8.10. 19. $14.35. 20. $100.30. 21. $40.50. 22. $24.

Page 161. — 1. $.90. 2. $.50. 3. $.72. 4. $.72. 5. $1.35. 6. $1.80. 7. $3. 8. $2. 9. $82.80.

Page 162. — 2. (*a*) $114.38; (*b*) $110.97; (*c*) $17.38; (*d*) $14.04.

Page 163. — 1. $18.24. 2. $10.66. 3. $29.61. 4. $6.08. 5. $2.21. 6. $11.15. 7. $19.69. 8. $51.30. 9. $76.95. 10. $4.54. 11. $164.94. 12. $268.80. 13. $705.38. 14. $2538. 15. $64.51. 16. $1.97.

Page 164. — 1. (*a*) $11.025; (*b*) $3.80; (*c*) $6.12; (*d*) $.8775; (*e*) $5.0625; (*f*) $10; (*g*) $2.115; (*h*) $9. 2. (*a*) $11.425; (*b*) $4.05; (*c*) $6.37; (*d*) $1.0275; (*e*) $5.2125; (*f*) $10.30; (*g*) $2.265; (*h*) $9.25. 3. (*a*) $.95; (*b*) $.34; (*c*) $.53; (*d*) $.09; (*e*) $.43; (*f*) $.86; (*g*) $.19; (*h*) $.77. 4. $1.43. 5. $18.76. 6. $18.30.

Page 165. — 7. $\frac{.34}{.43}$. 8. $.52. 9. $.65. 10. $20.66. 11. $.25. 12. $3.90. 13. $1.14. 14. $1.15. 15. $2.76.

Page 167. — TABLE 1. 2. $\frac{\$12.50}{\$16.25}$. 3. $\frac{\$13.00}{\$16.25}$. 4. $\frac{\$7.50}{\$8.25}$. 5. $\frac{\$6.40}{\$8.80}$. 6. $\frac{\$8.10}{\$9.00}$. 7. $\frac{\$35}{\$40}$. 8. $\frac{\$4.50}{\$6.30}$. 9. $\frac{\$3.45}{\$4.14}$. 10. $\frac{\$12.95}{\$15.54}$. 11. $\frac{\$31.00}{\$40.30}$. 12. $\frac{\$12.20}{\$14.03}$.

Table 2. **2.** $12.19. **3.** $10.83. **4.** $6.60. **5.** $7.92. **6.** $6. **7.** $35. **8.** $5.67. **9.** $2.76. **10.** $10.36. **11.** $30.23. **12.** $10.52.

Page 168.—**2.** 75+%; No. **3.** 6800 sq. ft.; No. **4.** 5145 sq. ft. **5.** Yes. **6.** 50%; 2760 sq. ft. **7.** 27+%.

Page 169.—**8.** Yes. **9.** 8+%. **10.** 15+%.

Page 170.—**1.** 147 gal.; 8820 gal. **2.** 70,560 gal. **3.** 588,000 lb.; 294 T.

Page 171.—**4.** 9408 cu. ft. **6.** 459 gal.; 27,540 gal. **7.** 61.2 cu. ft. **8.** 3825 lb. **9.** 114.75 T. **10.** 32.55 lb. **11.** 125 ft. **12.** 54.25 lb. **13.** 73.78 lb. **14.** 130 ft. **15.** 39.06 lb.

Page 172.—**1.** 16,540 cu. ft. **2.** 124,050 gal. **4.** June 1 to Sept. 1, 15,410 cu. ft.; 115,575 gal.; $28.89. Sept. 1 to Dec. 1, 16,430 cu. ft.; 123,225 gal.; $30.81.

Page 173.—**5.** (*a*) $.87; (*b*) $.92; (*c*) $.77; (*d*) $.99; $.77; $.92. **6.** $1.86.

Page 175.—**2.** $1.43. **3.** Feb. 1, $1.27; Mar. 1, $1.04; Apr. 1, $.92; May 1, $1.38; June 1, $1.50; July 1, $.46; Aug. 1, $.46; Sept. 1, $1.96; Oct. 1, $1.84; Nov. 1, $1.61; Dec. 1, $1.61.

Page 176.—**3.** $2.30.

Page 177.—**1.** $1.22. **2.** $2.02. **3.** Mr. Fales, $1.99; Mr. Belmore, $1.72; Mr. Forbes, $1.75; Mr. Harper, $1.53.

Page 178.—**1.** $31.25. **2.** $28. **3.** $51.30. **4.** $90.72. **5.** $109.68.

Page 179.—**2.** $1\frac{1}{5}$%; $1\frac{1}{5}$¢ on $1; $1.20 on $100; $12 on $1000. **3.** $1\frac{1}{10}$%; $1\frac{1}{10}$¢ on $1; $1.10 on $100; $11 on $1000. **4.** 2%; 2¢ on $1; $2 on $100; $20 on $1000.

Page 180.—**4.** Boone, $13.13; Thomas, $42.75; Lane, $33.90; Hayes, $11.93; Keen, $23.25.

Page 181.—**8.** Boone, $60.88; Thomas, $135; Lane, $58.15; Hayes, $142.93; Keen, $129.25.

Page 183.—**1.** $304.50. **2.** $440. **3.** $1.42; $92.30. **4.** $1.475; $663.75. **5.** $.01$\frac{3}{5}$; $83.20. **6.** $1\frac{1}{4}$%; $66.36. **7.** $103.70. **8.** $48.72. **9.** $1\frac{3}{4}$%; $1.75 per $100; $.0175 per $1; $36.75. **10.** Shoe factory, $910; box factory, $210; lumber yard, $148.75; coal yard, $136.50.

Page 184.—**1.** $58,695. **2.** $69,495. **3.** $63,000. **4.** $.015. **5.** $1.50. **6.** $15.

Page 185.—**1.** $77,928. **2.** $92,388. **3.** $82,800. **4.** $.018.

Page 187.—**1.** $200. **2.** $1.80. **3.** $.06; $60. **4.** $.40. **5.** $.12½. **6.** $75. **7.** $72.58; $475.78. **8.** $61,507,631.20. **9.** $6000.

Page 188.—**2.** (*a*) 1% on $20,000 + 1% on $3000; (*b*) 1% on $24,000 + 1% on $7000; (*c*) 1% on $15,000; (*d*) 1% on $6000; (*e*) 1% on $60,000 + 1% on $30,000 + 2% on $13,000; (*f*) 1% on $85,000 + 1% on $30,000 + 2% on $25,000 + 3% on $13,000; (*g*) 1% on $90,000 + 1% on $30,000 + 2% on $25,000 + 3% on $18,000; (*h*) 1% on $1500; (*i*) 1% on $67,000 + 1% on

\$30,000 + 2% on \$20,000; (*j*) 1% on \$97,000 + 1% on \$30,000 + 2% on \$25,000 + 3% on \$25,000; (*k*) 1% on \$147,000 + 1% on \$30,000 + 2% on \$25,000 + 3% on \$25,000 + 4% on \$50,000; (*l*) 1% on \$10,000.

Page 189. — 4. (*a*) \$20; (*b*) \$70; (*c*) \$190; (*d*) \$1070; (*e*) \$1640; (*f*) \$7520. 5. \$456. 6. \$260. 7. \$50,330; \$769.90. 8. \$6500; \$35. 9. \$240. 10. \$931. 11. \$732.

Page 191. — 1. \$30. 2. \$84. 3. \$61.20. 4. \$162; \$22.50. 5. \$15; \$1.25. 6. \$78. 7. \$32.40. 8. \$12.35.

Page 193. — 1. \$135; \$27. 2. \$252; \$50.40. 3. \$50.40. 4. \$228. 5. \$52.33. 6. \$87.50. 7. \$82.25. 8. \$145.75. 9. \$78.75. 10. \$135.

Page 194. — 1. \$137.34. 2. \$62.66. 3. \$157.28; \$42.72.

Page 195. — 4. \$134.99; \$65.01.

Page 196. — 5. \$164.04; \$35.96. 6. \$161.27; \$38.73. 7. \$588.19.

Page 197. — 1. \$2.25; 54+%. 2. \$2.80; 59+%. 3. 13+%. 4. 17+%; Yes. 5. Butter: (1) \$.05; 17+%; (2) \$.05; 16⅔%; (3) 3+%; (4) 3−%; No. Sugar: (1) \$.00½; 10+%; (2) \$.01; 20%; (3) 5+%; (4) 14+%; Yes. 6. Cutter, 50%; carpenter, 101+%; machinist, 71+%; typesetter, 75+%. 7. Cutter, 16⅔%; carpenter, 27+%; machinist, 21+%; typesetter, 5+%.

Page 198. — 1. (*a*) 166⅔%; (*b*) 104+%; (*c*) 15+%; (*d*) 6+%; (*e*) 23+%; (*f*) 33⅓%; (*g*) 66⅔%; (*h*) 25%. 2. (*a*) \$900; (*b*) \$517.50; (*c*) \$202.50; (*d*) \$360. 3. (*a*) \$78; (*b*) \$240; (*c*) \$160; (*d*) \$180.

Page 201. — 1. \$12.46. 2. \$16.38. 3. \$16.30. 4. \$19.20.

Page 202. — 5. \$17.06. 6. \$18.23. 7. \$14.48. 8. \$25.35.

Page 203. — 1. \$.40⅝. 2. \$.34⅜. 3. \$.46⅞. 4. \$.30⅝. 5. \$.29⅜. 6. \$.28⅛. 7. \$2.84. 8. \$2.75. 9. \$2.11. 10. \$2.22. 11. \$14.10. 12. \$9. 14. \$.56¼; \$27.

Page 204. — 2. \$10.80. 3. \$14.96. 4. \$11.52. 5. \$18.10. 6. \$9.80. 7. \$13.30. 8. \$15.33. 9. \$11.97.

Page 205. — 1. \$12.90. 2. \$11.13. 3. \$6.93. 4. \$13.50. 5. \$18.55. 6. \$13.68. 7. \$14.60. 8. \$17.63. 9. \$21. 10. \$16.28. 11. \$16.65. 12. \$15.12. 13. \$14.33. 14. \$19.36.

Page 207. — 1. \$2.25. 2. \$2.40. 3. \$3.45. 4. \$3.57. 5. \$2.64. 6. \$3.78. 7. \$2.70. 8. \$2.15. 9. \$3.75. 10. \$2.49. 11. \$2.58. 12. \$9.51. 13. \$12.84. 14. \$18. 15. \$15.58. 16. \$14.58. 17. \$18.54. 18. \$14.66. 19. \$13.30. 20. \$20.25. 21. \$13.50. 22. \$16.26.

Page 209. — 1. (*a*) \$310.50; (*b*) \$117; (*c*) \$156.60; (*d*) \$584.10; (*e*) \$537.37.

Page 210. — 2. (*a*) \$41.04; (*b*) \$73.20; (*c*) \$70.56; (*d*) \$184.80; (*e*) \$171.86; (*f*) \$4.62.

Page 211. — 3. \$3025.48. 4. \$75.64. 5. \$47.62. 6. \$36.49. 7. \$20.35.

Page 212. — 1. $4.50; $4.50; $1.50; $7.50; $12; $9. 2. $3.60; $6; $1.80; $10.20; $15.60; $12. 3. 14+%; 13+%. 4. 22+%; 33⅓%.

Page 218. — 1. (*a*) $320.43; (*b*) $1116.03. 2. $172.13. 3. $290.64.

Page 219. — 4. $209.70. 5. $246.75. 6. $387.63.

Page 221. — 1. $160. 2. $14.74.

Page 223. — 2. $605.43.

Page 226. — 2. $11.50. 3. $15.20. 4. $8.25. 5. $7.92. 6. $16.25. 7. $10.80. 8. $9.17. 9. $25.30. 10. $18.41. 11. $12.76. 12. $4.50. 13. $11.20. 14. $5.81. 15. $1.42. 16. $28.50. 17. $5.80. 18. $8.75. 19. $23.73. 20. $8.40. 21. $5.30. 22. $5.40. 23. $35.52. 24. $1.90. 25. $4.64. 26. $2.32. 27. $5.95.

Page 228. — 2. $208.08. 3. $260.10. 4. $312.12. 5. $364.14. 6. $416.16. 7. $468.18. 8. $520.20. 9. $728.28. 10. $1248.48. 11. $624.24. 12. $853.12. 13. $1560.60. 15. $151.50. 16. $454.58. 17. $286.82. 18. $1082.42.

Page 229. — 1. $487.08. 2. $292.22. 3. $371.42. 4. $413.46. 5. $199.44. 6. $411.30. 8. $784.25. 9. $209.14.

Page 231. — 1. $200. 2. Apr. 1; $75; $.75. 3. $200; $75. 4. $35. 5. $4.75. 6. $324; $6.48. 7. $20 and $10; $30; $.30.

Page 233. — 1. $175; $200; $220; $235; $245. 2. $175; $45. 3. $25. 4. $3.95. 5. $263.95; $283.95; $298.95; $308.95; $333.95; $363.95. 6. $263. 7. $45. 8. $25 and $30. 9. $5.71; $379.66.

Page 234. — 2. $300, the smallest or Mar. 28 balance. 3. $200. 4. $6. 5. $2. 6. $8; $558.

Page 235. — 1. $558; $758; $858; $1008; $608; $508. 2. $508. 3. $10.16. 4. $518.16; $593.16; $633.16; $658.16; $708.16. 5. $518.16; $10.36. 6. $140; $1.40. 7. $11.76; $719.92.

Page 237. — 1. 21 months. 2. $.4375 or $.44.

Page 238. — 3. The results are the same. 5. $10.

Page 239. — 1. $60. 2. $60. 3. $120. 4. $9. 5. (*a*) $720; (*b*) $720; (*c*) $1440.

Page 240. — 5. (*e*) $720; $280. 1. $25,063.33. 2. $5012.67. 3. $2506.33. 4. $3172.33.

Page 242. — 2. $1.87. 3. $3.80. 4. $2.52. 5. $.83. 6. $15.40. 7. $2.03. 8. $8.54. 9. $.16. 10. $4.59. 11. $9.45. 12. $4.73. 13. $6.56. 14. $11.29. 15. $1.40. 16. $3.68. 17. $2.63. 18. $1.45. 19. $.78. 20. $6.23. 21. $.29. 22. $4.43. 23. $8.93. 24. $.81. 25. $.72. 26. $14.37. 27. $2.81. 28. $4.13. 29. $4.55. 30. $1.93. 31. $1.54. 32. $10.07. 33. $7.80. 34. $8.78. 35. $8.61.

Page 243. — 2. $203.

Page 244. — 5. $6.25.

Page 245. — **2.** 189 days. **3.** 345 days. **4.** 250 days. **5.** 319 days. **6.** No. 21, due May 5, $5.25; No. 22, due May 16, $1.35; No. 23, $.71; No. 24, due July 26, $.62; No. 25, $1.09; No. 26, $3.01.

Page 247. — **1.** $50. **2.** $1850; $46.25. **3.** $1570. **4.** $39.25. **5.** $86.63. **6.** $55.60; $31.03. **7.** $52.50; Albert Jones.

Page 250. — **2.** $600. **3.** $225. **4.** $805. **5.** $360. **6.** $320. **7.** $900. **8.** $1170. **9.** $500. **10.** $630. **11.** $720. **12.** $1800. **13.** $550.

Page 251. — **1.** $2550. **2.** $5200. **3.** $3090. **4.** $6480. **5.** $8320. **6.** (*a*) $985; (*b*) $1320; (*c*) $1315; (*d*) $1740. **7.** $1,000,000.

Page 252. — **8.** Annually: $30; $35; $40; $45; $50; $60; semiannually: $15; $17.50; $20; $22.50; $25; $30. **9.** On $100: $3; $3.50; $4; $4.50; $5; $6; on $500: $15; $17.50; $20; $22.50; $25; $30. **10.** $4230. **11.** $114,800; because they paid 6%. **12.** 265 bonds; $1192.50; $4500; by taxation. **13.** $2460. **14.** $18,350.

Page 253. — **1.** $3708.66; $540. **2.** 14+%. **3.** 12+%. **4.** $360; 8−%.

Page 254. — **1.** *A*, 8400 sq. ft.; *B*, 10,125 sq. ft.; *C*, $9187\frac{1}{2}$ sq. ft.; *D*, 12,350 sq. ft.; *E*, 9000 sq. ft. **2.** $48, the first year; $51.84, the second year; $99.84, total. **3.** $184.09. **4.** $656.79. **5.** $379.63.

Page 257. — **1.** $29.75; $1487.50; $175. **2.** $44; $6.64. **3.** $54.75. **4.** $765. **5.** $55. **6.** $24.

Page 258. — **7.** $855. **8.** $6204. **9.** $223. **10.** $6035. **11.** $169.

Page 259. — **2.** (*a*) 32.4% or .324; (*b*) 31.8% or .318; (*c*) 31.9% or .319; (*d*) 31.4% or .314; (*e*) 30.5% or .305; (*f*) 29.8% or .298; (*g*) 28.9% or .298; (*h*) 12% or .120. **4.** Detroit, 54.9%; Washington, 54.4%; New York, 39%; Boston, 57.2%; Chicago, 49%; Boston, 60.1%; New York, 45.6%; St. Louis, 46.3%.

Page 260. — **6.** (*a*) 90%; (*b*) $94\frac{14}{19}$% or 94.7+%; (*c*) $86\frac{1}{9}$% or 86.1+%; (*d*) $85\frac{5}{7}$% or 85.7+%; (*e*) $87\frac{1}{2}$% or 87.5%; (*f*) $90\frac{10}{11}$% or 90.9+%; (*g*) $86\frac{16}{37}$% or 86.4+%; (*h*) $96\frac{24}{31}$% or 96.7+%. **7.** (*a*) $2.63; (*b*) $3.15; (*c*) $2.84; (*d*) $3.62; (*e*) $2.05; (*f*) $2.36; (*g*) $2.25; (*h*) $2.10. **8.** (*a*) $968; (*b*) $1170; (*c*) $1470; (*d*) $787.50; (*e*) $1056; (*f*) $1350.

Page 261. — **10.** $880. **11.** $2000. **13.** (*a*) $16\frac{2}{3}$%; (*b*) $14\frac{2}{7}$%; (*c*) 20%; (*d*) $11\frac{1}{9}$%; (*e*) 25%; (*f*) $14\frac{2}{7}$%; (*g*) $12\frac{1}{2}$%; (*h*) $5\frac{45}{51}$%; (*i*) $5\frac{10}{13}$%; (*j*) $13\frac{11}{53}$%. **14.** (*a*) $40; (*b*) $65.25; (*c*) $61.75; (*d*) $161.25; (*e*) $216; (*f*) $348.50; (*g*) $35; (*h*) $59. **15.** (*a*) 89+%; (*b*) 87+%; (*c*) 81+%; (*d*) 92%; (*e*) 84+%; (*f*) 81+%; (*g*) 83+%; (*h*) 67+%.

Page 262. — **16.** $12\frac{1}{2}$%. **17.** (*a*) $15\frac{5}{8}$%; (*b*) $18\frac{3}{4}$%; (*c*) $7\frac{13}{16}$%; (*d*) $21\frac{7}{8}$%; (*e*) $4\frac{11}{16}$%; (*f*) $9\frac{3}{4}$%; (*g*) $17\frac{3}{16}$%; (*h*) $34\frac{3}{8}$%; (*i*) $37\frac{1}{2}$%. **18.** (*a*) $6\frac{1}{4}$%; (*b*) $9\frac{3}{8}$%; (*c*) $18\frac{3}{4}$%; (*d*) $7\frac{13}{16}$%; (*e*) $31\frac{1}{4}$%; (*f*) $28\frac{1}{8}$%; (*g*) $37\frac{1}{2}$%; (*h*) $34\frac{3}{8}$%; (*i*) $15\frac{5}{8}$%. **19.** (*a*) $17\frac{3}{16}$%; (*b*) $6\frac{2}{3}$%; (*c*) $66\frac{2}{3}$%; (*d*) $57\frac{17}{19}$%. **20.** Java, $6\frac{2}{3}$%; Maracaibo, 20%; Mocha, 10%; Pan American, $11\frac{1}{9}$%; Rio, $12\frac{1}{2}$%. **21.** 1907, $7\frac{1}{7}$%; 1908, $14\frac{2}{7}$%; 1910, $21\frac{3}{7}$%; 1915, $35\frac{5}{7}$%.

Hunt, B.
A community arithmetic.

NAME	DATE	NAME	DATE

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A community arithmetic.

NAME	DATE	NAME	DATE